STUDY ON HAEMATO-BIOCHEMICAL CHANGES IN LANTANA TOXICITY AFFECTED CATTLE IN SOUTHERN RAJASTHAN

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ABSTRACT

This study was conducted to find out the effect of *Lantana camara* toxicity in cattle in and around areas of Udaipur. A total of 20 cattle were divided into two groups based on the day on which the case was presented after showing symptoms in clinics. The early cases were those which were presented up to 3 days and late cases were those which were presented on 4th day and onwards. One group of 10 healthy cattle was served as control group, to observe the haemato-biochemical changes in affected cattle. Diagnosis was based on history, thorough physical and clinical examination of cattle affected with lantana toxicity. All the clinical cases of the lantana toxicity and healthy animals of control group were subjected to collection of blood sample for haemato-biochemical investigation. The haematological parameters revealed significant increase in haemoglobin (Hb) and packed cell volume (PCV) and no significant difference was observed in total erythrocyte count (TEC) and total leucocyte count (TLC) in early cases however there was significant increasing trend in late cases. Slight fall in platelet count was seen in late cases. Differential leucocyte count (DLC) revealed significant increase of neutrophils and significant decrease in lymphocytes and eosinophils in late cases. Examining the serum biochemical indices, serum aspartate amino transferase (AST), serum alanine amino transferase (ALT), blood urea nitrogen (BUN), serum creatinine (CREA), serum albumin (Alb), serum total protein (TP), serum alkaline phosphate (ALKP) and lactate dehydrogenase (LDH) were found significantly increased in animals affected with lantana toxicity than healthy control group.

Key words: *Lantana camara,* cattle, Rajasthan, haematology, biochemistry

Introduction

Toxic plants are of major concern to veterinarians because of their harmful effects to livestock in terms of causing mortality and reduction in productivity (Sharma *et al*., 2007; Diaz, 2011). Among poisonous plants *L. camara* is one of the most commonly known noxious and invasive weed worldwide. The most important toxic components present in this weed are lantadenes. Lantadenes are pentacyclic triterpenes and often led to hepatotoxicity, photosensitization and jaundice (Sharma and Makkar, 1981; Sharma *et al*., 2007). Lantana toxins cause intrahepatic cholestasis along with the inhibition of bile secretions without widespread hepatic necrosis (Pass *et al.* 1979) and hepatocellular damage precedes the intense and prolonged jaundice (Sharma *et al*., 2007). There was an increase in direct and total bilirubin, increase in the phylloerythrin levels, increase in serum AST, ALP, LDH, serum total protein, serum albumin, and serum globulin and decrease in albumin/globulin ratio in cattle (Dwivedi *et al.* 1971). Need to conduct this study was to understand the haemato-biochemical alterations with the ingestion of the *Lantana camara*.

Materials and Methods

The present study was conducted on total 20 animals (cattle) of different breed, age groups and sex. For haematological parameters, blood samples were collected from the jugular vein, using 18-20 gauge, 2.5 cm long sterilized needle and 20 ml disposable syringe. Out of which, 5 ml blood was collected in sterilized test tube containing disodium salt of ethylene diamine tetra acetic acid (EDTA) as an anticoagulant @ 1 mg/ml of blood from lantana affected animals.

For biochemical studies, blood was collected in other sterile tube without anticoagulant for the separation of serum. Blood slants were made and incubated for one hour at 30°C. The tubes were then refrigerated for some time (allowing retraction of clot) and centrifuged at 2500 rpm for 30 minutes to separate the serum. On separation, serum was immediately transferred into sterilized screw capped vial; a drop of methiolate solution (1:10000) was added and stored in deep freeze at -20°C for biochemical estimation.

The blood samples were also collected from 10 healthy animals (healthy control group) as described above and subjected for the estimation of haematological and biochemical values.

Various haematological parameters viz. Haemoglobin (Hb), Packed cell volume (PCV), Total erythrocyte count (TEC), total leucocyte count (TLC), differential leucocyte count (DLC), platelet count were estimated. While, biochemical parameters *viz.* serum aspartate aminotransferase (AST), Serum alanine aminotransferase (ALT), Blood Urea Nitrogen (BUN), Serum creatinine (Cr), Serum glucose (GLU), Serum albumin (ALB), serum total protein (TP), Serum alkaline phosphate (ALKP) and Lactate dehydrogenase (LDH) were estimated using Auto-Biochemistry Analyser-IDEXX VetTest, Mfg by IDEXX Laboratories, Maine, U.S.A.

The data obtained were statistically analyzed and compared by Duncan's multiple range test and the standard statistical procedures described by Sendecor and Cochran (1994).

Results and Discussions

Total of the 20 animals (cattle) were assessed for the

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haemato-biochemical parameters which were further compared to the healthy control group. There was difference in the haemato-biochemical findings in animals which were brought early, than the animals which were brought late for treatment.

Haematological parameters

The respective mean values of haemoglobin in early and late groups were found significantly (p<0.001) higher than control group (Table 1). This may be due to haemo-concentration and because of low water and feed intake. These results were in accordance with Thirunavukkarasu *et al*. (2001). The mean values of PCV in late and all cases were significantly (P<0.01) higher than control group as well as early cases due to haemoconcentration and dehydration which are in accordance to Sharma *et al*. (1982) and Parimoo *et al*. (2014). There was no significant difference in the total erythrocyte count and total leukocyte count in apparently healthy control animals and early cases however, significant increasing trend was noticed in late and all diseased cases of lantana toxicity. Increase in the total erythrocyte count values in *Lantana camara* induced toxicity in guinea pigs was also observed by Sharma *et al*. (1982) and Parimoo *et al*. (2014). Leukocytosis might be due to normal body reaction to foreign object which is in accordance with the findings of Thirunavukkarasu *et al*. (2001), Sharma *et al*. (1982) and Parimoo *et al*. (2014). Slight fall in platelet count was seen in late cases from healthy control group and early cases of lantana in affected cattle. In late cases the neutrophilic count was significantly (P<0.01) higher than control group as well as early and all diseased cases (Table 1). These findings are in accordance with Ali *et al.* (1995), Thirunavukkarasu *et al.* (2000), Singh *et al.* (2003), Dhanesh *et al.* (2013) and Srikanth and Kumar (2013), who reported leuocytosis associated with neutrophilia in goats, cross bred cows, sheep, cross bred heifer and cross bred Jersey cattle showing jaundice and photosensitization due to lantana toxicity.

Table 1: Haematological profile in lantana toxicity (Mean ± S.E.)

S. No.	Parameters	Control (N=10)		Early Cases (N=9)		Late Cases (N=11)		Over all diseased cases (Early + Late) (N=20)	
		Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.	Range
1	Hb (g/dl)	10.43 ± 0.27	9.05-11.45	11.12 ± 0.23	10.1-12.5	12.30 ± 0.63**	10-18	11.77 ± 0.38	10-18
2	PCV (%)	37.30 ± 0.40	35-39	37.40 ± 0.37	34.5-41	45.49 ± 1.74**	40.35-56.25	41.66 ± 1.41**	34.5-56.25
3	TLC ($X10^3/\mu l$)	7.61 ± 0.25	6.5-8.75	7.89 ± 0.18	7.12-8.8	7.98 ± 0.25	8.14-10.84	8.98 ± 0.28*	7.12-10.84
4	TEC ($X10^6/\mu l$)	7.66 ± 0.23	6.45-8.75	8.31 ± 0.28	7.21-9.75	9.32 ± 0.10	8.75-9.77	8.87 ± 0.18*	7.21-9.77
5	Platelets (X105/µl)	7.08 ± 0.28	5.5-8.25	6.70 ± 0.22	5.32-7.75	4.64 ± 0.21	3.5-5.9	5.57 ± 0.28	3.5-7.75
6	DLC								
a.	Neutrophils (%)	25.90 ± 0.78	22-30	34.44 ± 0.61	32-38	44.45 ± 1.97	41-48	39.95 ±1.22	32-48
b.	Monocytes (%)	3.50 ± 0.37	2-5	3.89 ±0.19	3-5	4.73 ± 1.10	3-6	4.35 ± 0.22	3-6
c.	Lymphocytes (%)	68.40 ± 0.83	66-75	54.22 ± 0.92	50-59	44.91 ± 2.51	42-50	49.10 ± 1.21	42-59
d.	Eosinophils (%)	3.70 ± 0.30	2-5	3.44 ± 0.28	2-5	1.82 ± 0.23*	1-3	2.55 ± 0.26	1-5

* = Highly significant at (P<0.01%)

Table 2: Blood Biochemical Profile in lantana toxicity cases (Mean ± S.E.)

Sr. No.	Parameters	Control (N=10)		Early Cases (N=9)		Late Cases (N=11)		Over all diseased cases (Early + Late) (N=20)	
		Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.	Range	Mean ± S.E.	Range
1	ALT (IU/L)	35.50 ± 0.62	32-38	61.22 ± 0.89	56.5-64.5	70.18 ± 0.81**	64.5-74	66.15 ± 1.18	56.5-74
2	AST (IU/L)	59.7 ± 1.36	54-65	167.06 ± 3.24	145.2-178.5	221.68 ± 19.32**	154-330	197.10 ± 12.21	145.2-330
3	BUN (mg/dl)	15.60 ± 0.62	12-18	30.03 ± 0.70	28.14-34.5	45.99 ± 0.35**	44.2-47.8	38.81 ± 1.86	28.14-47.8
4	Cr (mg/dl)	0.77 ± 0.02	0.65-0.95	1.67 ± 0.07	1.32-1.93	3.05 ± 0.07**	2.65-3.35	2.43 ± 0.16	1.32-3.35
5	Alb (g/dl)	2.99 ± 0.08	2.5-3.35	3.58 ± 0.10	3.15-3.9	4.04 ± 0.09*	3.56-4.45	3.83 ± 0.09	3.15-4.45
6	Glb (g/dl)	3.41 ± 0.10	2.9 -3.8	4.89 ± 0.09	4.5-5.2	5.67 ± 0.21*	5.2-5.9	5.32 ± 0.46	4.5-5.9
7	A/G Ratio	0.88 ± 0.01	0.82-0.92	0.73 ± 0.01	0.64-0.79	0.71 ± 0.05*	0.78-0.63	0.72 ± 0.01	0.63-0.80
8	TP (g/dl)	6.84 ± 0.13	6.15-7.38	8.53 ± 0.19	7.45-9.55	9.79 ± 0.49**	8.58-14.56	9.24 ± 0.31	7.45-14.56
9	ALKP (IU/L)	45.08 ± 1.11	40.45-49.65	155.14 ± 3.00	145-172.3	195.53 ± 7.28**	172.24-255.45	177.35 ± 6.20	145-255.45
10	Serum glucose (mg/dl)	49.95 ± 1.16	44.76-54.3	47.17 ± 0.55	45.3-50.7	43.20 ± 0.53*	40.53-46.15	44.99 ± 0.60	40.53-50.7
11	Lactate dehydrogenase (IU/L)	2115.20 ± 5.22	1866-2343	3572.00 ± 106.67	3032-3940	4408.82 ± 113.94**	3842-4978	3990.41 ± 123.59	3032-4978

** = Highly significant at (P<0.01%)

Similarly Bush (2002), concluded that neutrophilic leukocystosis and increase in mononuclear cell proliferation in response to hepatic membrane protein in chronic hepatitis are the result of inflammatory responses. On other hand there was significant decrease ($p<0.01$) in lymphocytic and eosinophilic count in later cases of lantana toxicity.

Biochemical parameters

Biochemical parameters were recorded as - ALT and AST has highly significant ($p<0.001$) increase in all, early, late and overall cases (Table 2). The increased activity of transferases was suggestive of degenerative changes in the liver (Kaneko *et al*., 1999).

BUN has highly significant ($p<0.001$) increase in early, late and overall cases. Markedly increased blood urea nitrogen (BUN) levels were suggestive of renal impairment during lantana toxicity. Renal failure associated with renal injury was reported in lantana intoxicated animals (Seawright and Allen, 1972). Reduced glomerular filtration because of decreased blood flow to kidney on account of dehydration might also have contributed to increased blood urea nitrogen (BUN) level Benjamin (1998). Creatinine also has significant ($p<0.01$) increase in early cases to but highly significant ($p<0.001$) increase in late and overall diseased cases (Table 2) suggestive of renal damage due to cumulative toxicity. Results of present study were in accordance with Singh *et al*. (2003) they revealed increase in creatinine (CREA) levels in outbreak of *Lantana camara* toxicity in sheep.

The values of albumin (ALB) and total protein (TP) were also significantly higher in early and late cases of lantana toxicity than in healthy group (Table 2). Further, the A/G ratio was decreased in early, late and in all diseased cases of lantana toxicity (Table 2). This may be due to relative or absolute increase in globulin than albumin which is seen in conditions of chronic inflammation or antigenic stimulation (Benjamin,1998).

ALKP showed highly significant increase in early, late in all diseased cases than in healthy group. Significant increase in the alkaline phosphatase activity was indicative of cholestasis Uppal and Paul (1978).

Blood glucose showed non-significant decrease in early cases but highly significant ($p<0.001$) decrease in late and all diseased cases (Table 2). Hypoglycemia observed in the late presented cases may be due to anorexia and complicated by liver disorder. Gopinath and Ford (1969) reported marked loss of glycogen in parenchymal cells of periportal region in lantana poisoning in sheep.

Lactate dehyrogenase (LD) showed highly significant ($p<0.001$) increase in all cases (Table 2). These changes were suggestive of degenerative changes in the liver and cholestasis.

On perusal of the results obtained in the present study, we conclude that there was significant variation in both haematological and biochemical changes associated with early and late cases of lantana toxicity from the healthy control group. Thus, it is concluded that the changes observed in affected animals were probably due to degenerative changes in liver and kidneys caused by intoxication of *Lantana camara*.

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