International Journal of Science, Environment and Technology, Vol. 9, No 6, 2020, 963 – 972

ISSN 2278-3687 (O)
2277-663X (P)

TOXIC EFFECT OF *Lantana camera* AND PROTECTIVE ROLE OF *Picrorhiza kurroa* IN WISTAR RATS: HAEMATO-BIOCHEMICAL STUDIES

Birajdar B.W*, Gangane G.R[1], Moregaonkar S.D.[2], Narote S.R[#] and Shingumare B.G.

[1]Major Guide and Associate Professor, Dept. of Vet. Pathology

[2]Professor & Head, Dept. of Vet. Pathology

Department of Veterinary Pathology,

College of Veterinary and Animal Sciences, VNMKV Campus, Parbhani- 431402

Maharashtra Animal and Fishery Sciences University, Nagpur (MS)

[#]E-mail: satishnarote155@gmail.com (*Corresponding author*)

[*Part of M.V.Sc. thesis of First author (Submitted to MAFSU, Nagpur, Maharashtra)]

Abstract: The aim of this study was to evaluate toxic effects of *Lantana camera* and protective role of *Picrorhiza kurroa* in Wistar rats. A total of 48 Wistar rats were randomly divided into four equal groups each comprising of 12 rats (6 males & 6 females). Group I served as normal feed with drinking water *ad libitum.* Rats of group II were treated with *Lantana camera* leaves powder @ 0.25 % per kg Bwt through feed. Group III rats were fed with *Lantana camera* leaves powder @ 0.25 % per kg Bwt + *Picrorhiza kurroa* powder @ 50 mg daily through feed and Group IV rats were fed with powder of *Picrorhiza kurroa* @ 50 mg daily through feed. Haemato-biochemical parameters were studied on 0, 14th and 28th days of the experiment.

In rats fed with *Lantana camera* leaves powder revealed non- significant reduction in Hb and TEC. However, there was marginal incline in mean values of TLC and non significant reduction in mean values of lymphocyte count and significant increase in mean values of blood clotting time when compared to the control group rats (Group I). Rats treated with powder of *Picrorhiza kurroa* (Group IV) did not show any significant haematological variations when compared to control group. Biochemical profiles revealed significant increase in Serum levels of ALT, AST, creatinine and BUN in rats of Group II but the rats of Group III showed comparably low levels than Group II. Rats of group II had lower level of STP but group III resulted into elevation in STP levels.

Keywords: *Lantana Camera*, Wistar rats, Haematolo-biochemical, *Picrorhiza kurroa.*

Introduction

Livestock animal husbandry – as a being a major agrarian country business - organized farming. But at rural level, due to consistent drought animals are compelled to take plants which may be of toxic nature**.** Toxic plants are of major concern to Veterinarians because of their harmful effects to livestock in terms of reducing productivity and causing mortality [16&5]. Among poisonous plants *L. camera* is one of the most commonly known noxious[14&10] and invasive weed worldwide [12, 2, 20, 11 & 21]. This weed is responsible to causing heavy

*Received Dec 23, 2020 * Published Dec 31, 2020 * www.ijset.net*

mortality in livestock as well as loss of agro and forest ecosystem [4,10&16]. *Lantana camera* toxicity caused by lantadenes is characterized by intrahepatic cholestasis, associated liver damage and photosensitization [7].

In India, hepatoprotective medicinal plants and their formulations have been traditionally used in Ayurveda for the prevention and treatment of diverse liver diseases. *Picrorhiza kurroa* has been commonly used and well investigated for the treatment of jaundice. The plant has also been shown to be hepatoprotective in various animal models of hepatotoxicity like carbon tetrachloride, d-galactosamine, paracetamol and thioacetamide[19].

Considering these facts, present study have been planned to assess protective effect of *Picrorhiza kurroa* against *Lantana camera* induced toxicity in Wistar rat through haemato-biochemical studies.

Materials and Methods

A total of 48 Wistar rats ageing about 4-6 weeks and approximately 140-150 gms of weights were divided into four groups, each comprising of 12 rats each (6 females + 6 males) and were maintained for 28 days. The animals were procured from Laboratory animal house, College of Veterinary and Animal Sciences, Parbhani. Prior to experiment, all the rats were kept at laboratory condition for a period of 7 days for acclimatization. The animals were housed in polypropylene cages under controlled conditions. The animals were maintained under standard managemental conditions and provided with feed and water *ad-libitum* throughout experimental period.

Collection and procurement of *L. camera* and *P. kurroa* plant

Collection of the plant from the campus area near of VNMKV, Parbhani, and the plant material was identified and confirmed by Botanist from Department of Agriculture Botany, VNMKV, Parbhani and collected fresh leaves of *L. camera* were cleaned with clean water and air dried in the laboratory room for about 8-10 days at room temperature and powdered using electric grinder, The powder of *Picrorhiza kurroa* (kutki) was procured from the local market of Parbhani.

Table 1: Details of Experimental groups

Groups	Treatment	No. of rats (6 male+ 6 Female)
I	*Ad libitum* feed and water daily for 28 days	12
II	Powder of *Lantana camera* leaves @ 0.25% of body weight through feed daily for 28 days	12

III	Powder of *Lantana camera* leaves @ 0.25% + powder of *Picrorhiza kurroa* @ 50 mg/kg of body weight through feed daily for 28 days	12
IV	Powder of *Picrorhiza kurroa* @ 50 mg/kg of body weight through feed daily for 28 days	12

Haemato-biochemical parameters

The blood samples were collected from the retro-orbital plexus from the rats in clean, dry and sterilized EDTA vials samples and about 1.5-2 ml volume blood were collected from the rats into clean, dry and sterilized test tubes without anticoagulant and used for separation of serum.

Statistical Analysis

The data generated from various parameters were statistically analyzed by Completely Randomized Design (CRD) to know the statistical differences between means of various parameters at different intervals in each group as per the method described by Snedecor and Cochran [20].

Results and Discussion:

Haematological studies: Table 2 depicts the details of haematological parameters studied.

Table 2: Table showing mean values of Haematological parameters of experimental wistar rats studied at 14th and 28th day of interval of study

Haematological Parameters																	
Parameter	**Group I**				**Group II**				**Group III**				**Group IV**				**CD**
	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	-
Hb (g/dl)	14.05± 0.74	14.15 ±0.33	14.55 ±1.37	13.95±0.74	12.10 ±0.57	13.36±0.51	12.48±0.64	12.80±0.50	12.23±1.44	13.93±0.89	12.55 ±0.74	13.50±0.70	14.36±0.33	14.58±0.27	16.61±1.51	13.55±0.85	NS
TEC (10^6/cmm)	8.02 ±0.42	7.74 ±0.31	8.50± 0.37	8.31 ±0.20	6.76± 0.22	7.25 ±0.39	7.42 ±0.50	8.01 ±0.37	7.37 ±0.70	7.32 ±0.19	8.37± 0.40	8.18 ±0.39	8.06 ±0.69	7.80 ±0.37	8.57 ±0.29	8.59 ±0.53	NS
PCV(%)	34.63±0.88	32.20 ±0.69	35.35 ±1.06	32.73±1.26	33.18 ±2.43	32.26±0.99	35.48±3.55	32.81±1.26	33.93±1.37	34.83±1.15	41.03 ±1.93	36.01±1.67	36.25±1.43	36.28±2.41	39.90±2.54	38.45±3.20	NS
TLC (10^3/cmm)	9.10 ±0.52	8.07± 0.32	9.57± 0.43	9.20 ±0.23	9.88± 0.66	9.95 ±0.75	11.50±0.74	11.51±0.84	9.67 ±0.89	9.78 ±0.76	9.48± 0.35	10.98±0.51	9.05 ±0.60	9.58 ±0.85	10.10±0.66	9.82 ±0.35	NS
CT (Sec)	142.00^c± 0.72	140.67^c±2.07	156.67^c±1.92	130.50c± 0.77	175.33^c±0.67	184.83^a± 0.61	212.67^a± 0.67	206.17^a± 0.61	140.00^b± 0.58	160.66^b± 085	161.66^b±0.67	197.67^b± 0.96	141.33^c± 2.79	146.33^c± 4.87	157.00^c± 0.57	137.83^c± 4.96	3.271 (14th d

																	M) 7.603 (14th d F) 4.996 (28th d M) 7.939 (28th d F)
Neutrophils (%)	18.83±1.31	13.16±2.97	18.33±0.89	14.50±1.90	22.17±0.70	21.16±0.91	23.23±0.89	22.67±0.49	21.33±0.99	22.00±0.57	23.66±0.89	20.50±0.61	19.33±1.08	17.83±2.28	18.00±0.96	18.00±1.98	NS
Eosinophils (%)	2.33±0.49	1.50±0.42	1.00±0.36	2.33±0.33	1.50±0.23	1.50±0.23	1.00±0.36	1.67±0.22	1.83±0.40	1.50±0.23	1.50±0.42	1.50±0.23	2.17±0.47	1.67±0.43	2.00±0.36	2.50±0.34	NS
Lymphocytes (%)	77.00±0.94	82.16±3.39	78.00±0.96	78.50±1.64	73.67±0.84	72.66±1.08	74.00±0.57	72.00±0.96	74.17±1.14	73.00±0.73	72.50±1.02	74.16±1.07	76.17±0.70	76.16±2.12	76.33±1.03	75.50±1.44	NS
Monocytes (%)	1.83±0.61	3.16±0.83	2.50±0.77	4.67±0.33	3.00±0.44	4.67±0.43	1.50±0.42	3.67±0.56	3.50±3.50	3.83±0.47	2.33±0.56	3.83±0.61	2.33±0.72	4.33±0.49	3.67±0.76	4.00±0.63	NS

Superscripts are to be read column wise for mean comparison

Mean with similar superscripts in column do not differ significantly ($P < 0.05$)

All the haematological parameters except clotting time of rats of control group I and plant control group IV showed within normal physiological limits. The mean values of hemoglobin concentration in male rats at 14th day and 28th day of the study period found to be reduced non-significantly in experimental rats of Group II when compared with mean values of control group. Also, the haemoglobin concentration in female rats of Group II and Group III showed non-significant decrease at 14th day and at 28th day, when compared to control group. The haemoglobin concentration was found to be decreased marginally at 14th and 28th day of experiment in male and female rats of group II.

The present observations of reduction in haemoglobin could be due to RBC destruction and hemolysis. Decrease of RBC might be due to increase in its fragility [9]. Depletion in haemoglobin content is an indication of defective haematopoiesis[10].

There was marginal reduction in mean values of Total Erythrocyte count in male rats of Group II and Group III as compared to control group, The mean values of mean TEC in female rats of Group II and Group III which were comparatively lower than respective control group at 14th and 28th day intervals,

Reduction in TEC could be due to RBC destruction and hemolysis and also, decrease in RBC might be due to increase in its fragility[9].

There was non-significant variation in mean values of PCV in male as well as female rats in almost treatment groups when compared to respective control group values.

These findings are similar with the observations of [3] who reported non-significant change in mean PCV value in *L. camera* exposed rats.

There was marginal increase in mean values of TLC at 14th and 28th day in male and female rats of group II. The findings of present study are in accordance with the findings of [19] and [15] who reported increase in values of TLC in guinea pig in *L. camara* toxicity

There were no significant alterations in DLC counts amongst themselves as well with respective control group values.

There was significant increase in mean values of clotting time in male as well as female rats of group II at 14th and 28th day of study period when compared with control Group values. Also, similar trend of increase in the clotting time in male & female rats of Group III at 14th and 28th day of study period was noted when it was compared with control group with marginal improvement.

Increase in clotting time in the *L. camera* toxicated rabbits resulted due to decrease in prothrombin, protein synthesis & fibrinogen due to hepatic damage. Also, decreased absorption of Vit.K triggered the clotting time. The decrease in platelet count disturbed due to the hepatic damage as well bone marrow injury could result into increase the clotting time[9].

The experimental rats of group III which were toxicated with *L. camera* leaves and fed with *P. kurroa* powder elicited ameliorative effect as supported by haematological values obtained.

Biochemical studies:

Table 3 depicts the details of biochemical parameters studied

All the biochemical parameters except serum total protein of rats of control group I and plant control group IV showed within normal physiological limits

The mean serum ALT values in male and female rats of group II at 14th and 28th day of estimations were increased significantly than control group. However, the mean values of ALT in male rats of group III at 14th and 28th day of interval remained comparable with control group while in female rats were elevated significantly but statistically these values remained comparable with respective control group value indicating ameliorative effect of *P. kurroa*.

In male and female rats of group II the mean AST values at 14th and 28th day of study period were inclined significantly than the control group and in group III at 14th as well 28th day of estimations remained comparable with respective control group values, except, the mean AST value in female at 28th day showed significant elevation

The extent of elevation in mean AST values of rats of group III than group II found to be comparatively less probably could be due to hepatoprotective role of *P. kurroa.*

The present findings in respect of mean ALT values are in concurrence with the reports of [10, 18, 8, 3 and1]. The high ALT activity might be due to high liver microsomal membrane fluidity, free radical generation and alterations in the liver tissue and The high AST activity might be due to effect of *Lantana camera* plant leaves which might be destroying the permeability of the cell membrane, resulting in to increased release of cytosolic enzymes into the circulation.

The mean values of serum creatinine in male and female rats of group II at 14th and 28th day of estimation were increased significantly than the control group and group III at 28th day comparable with the control group This improvement was up to Table 3.

Table 3: Table showing mean values of Biochemical parameters of experimental wistar rats studied at 14th and 28th day of interval of study

Biochemical parameters																	
Parameter	**Group I**				**Group II**				**Group III**				**Group IV**				**CD**
	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	14th day M	14th day F	28th day M	28th day F	-
ALT (IU/L)	29.67^{b}±1.11	31.16^{b}± 1.37	31.17^{b}± 1.40	28.33^{b}± 1.28	38.50^{a}± 3.69	37.33^{a}± 4.46	35.50^{a}± 1.17	33.17^{a}± 1.64	34.33^{b}± 2.29	34.17^{ab}± 2.10	29.83^{b}± 0.61	31.83^{ab}± 1.14	29.33^{b}± 1.42	28.67^{b}± 1.62	29.83^{b}± 0.79	29.00b± 1.04	6.942 (14th d M) 5.522 (14th d F) 3.075 (28th d M) 3.810 (28th d F)
AST (IU/L)	87.00^{b}±3.34	84.50^{b}± 2.79	79.33^{b}± 3.02	83.33^{b}± 2.57	96.33^{a}± 2.05	94.00^{a}± 3.48	98.00^{a}± 1.88	96.83^{a}± 1.57	82.50^{b}± 1.72	82.00^{b}± 1.65	85.50^{b}± 3.25	89.83^{ab}± 4.20	82.16^{b}± 1.70	81.33^{b}± 3.36	83.67^{b}± 3.92	82.83^{b}± 1.49	6.787 (14th d M) 8.598 (14th d F) 9.177 (28th d M) 7.944 (28th d F)

creatinine (mg/dl)	1.17^{b} ±0.03	1.30^{b}±0.16	1.16^{b}±0.03	1.18^{b}±0.04	1.28^{a}±0.06	1.83^{a}±0.09	1.45^{a}±0.07	1.47^{a}±0.07	1.20^{ab}±0.03	1.53^{ab}±0.20	1.28^{b}±0.04	1.25^{b}±0.05	1.23^{b}±0.04	1.30^{b}±0.06	1.17^{b}±0.03	1.18^{b}±0.04	1.151 (14^{th} d M) 0.417 (14^{th} d F) 0.139 (28^{th} d M) 0.132 (28^{th} d F)
BUN (mg/dl)	17.03^{b}±0.56	17.25^{bc}± 1.88	18.36^{b}± 0.64	21.60^{b}± 1.44	21.80^{a}± 1.15	22.82^{a}± 0.60	22.10^{a}± 1.20	25.95^{a}± 0.84	18.15^{b}± 0.51	20.31^{ab}± 0.89	20.18^{b}± 0.99	22.98^{b}± 1.22	16.86^{b}± 0.69	16.82^{c}± 0.62	18.36^{b}± 0.66	20.84^{b}± 0.36	2.282 (14^{th} d M) 3.326 (14^{th} d F) 2.672 (28^{th} d M) 3.101 28^{th} d F)
Total protein (gm/dl)	8.25 ±0.17	8.27 ±0.25	8.25 ±0.23	7.87 ±0.29	8.02 ±0.18	7.98 ±0.33	7.95 ±0.39	7.50 ±0.23	7.82 ±0.19	8.22 ±0.46	8.00 ±0.20	7.50 ±0.34	8.10 ±0.24	8.60 ±0.32	8.12 ±0.15	7.67 ±0.24	NS

Superscripts are to be read column wise for mean comparison

Mean with similar superscripts in column do not differ significantly ($P < 0.05$)

the levels in control group values indicating beneficial effect of *P. kurroa* similar findings observed by [1 &3].

At 14^{th} day of experiment, the mean values of BUN in male and female rats of groups II and group III were elevated significantly than control. Similarly, in male as well female, these mean values showed significant hike than control group as well its amelioration at 28^{th} day of trial. Similarly, Chhaya *et. al.* (2010) recorded significant reduction in the BUN values in rats which were toxicated with cisplatin and treated with *P. kurroa*.

The mean serum total protein values in present study indicated marginal decline in male and female rats in *L. camera* intoxicated group II. However, the mean values of group III and IV showed significant variation The present observation is in concurrence with the finding of[8] who reported lower serum total protein values in Murrah buffaloes, in *L. camara* toxicity.

The biochemical parameters attempted in the present study showed significant elevation in mean values of ALT, AST, Serum creatinine and BUN in male and female rats of group II which were fed with *L. camera* leaves daily for 28 days, and indicated signs of hepato and nephro toxicity. The mean values of Serum total protein in male and female rats of group II found to be decreased marginally than the control group.

The levels of these parameters recorded in male and female rats of group III which were fed with *L. camera* leaves and *P. kurroa* powder showed non-significant to significant reduction than the mean values of group II indicating ameliorative effect of treatment given. In male and female rats of group IV, all studied parameters remained comparable with control group at all scheduled intervals of study period.

Acknowledgement

Authors are very much thankful to Associate Dean, College of Veterinary and Animal Sciences Parbhani, Maharashtra, India for providing facilities during conduct of research for experimental rats to conduct present research

References

[1] Asadu C.L., O. Abonyi, C.A. Anosike, P.N. Uzoegwu and R.I. Uroko (2015) In vivo toxicological studies on methanol leaf extract of *Lantana camera* American-Eurasian Journal of Toxicological Sciences 7 (2): 115-122.

[2] Baars J.R. (2003) Geographic range, impact, and parasitism of Lepidopteran species associated with the invasive weed *Lantana camara* in South Africa. Biological Control 28: 293–301.

[3] Bihari (2014), the effect of picroliv on *lantana camara* toxicity in female wistar rats**,** PG thesis submitted. Maharashtra Animal and Fishery Sciences, University, Nagpur.

[4] Day, M., C. J. Wiley, J Playford and M.P. Zalucki, (2003) Lantana: Current Management, Status and Future Prospects. Australian Centre for International Agricultural Research, Canberra.

[5] Diaz G.J. (2011) Toxic plants of veterinary and agricultural interest in colombia. International Journal of Poisonous Plant Research 1: 1-19.

[6] Gadgoli H. Chhaya, Surekha Yamgar, Lalit Sali, Rashmi Salkar, Naveenkumar Jain (2010) Studies on nephroprotective and nephrocurative activity of ethanolic extract of *picrorhiza kurroa royle* and *arogyawardhini bati* in rats IJPT. Vol. 2 No.3 472-489.

[7] Ghisalberti E.L (2000). *Lantana camara* L. (Verbenaceae). Fitoterapia71: 467–486. [8] Hussain, K., M. Sultana, J. S. Soodan, R. Singh and R. B. Kushwaha (2013) *Lantana camara* ingestion induced Photosensitization and dermatitis in buffaloes. Intas Polivet, 14 (II): 215-217.

[9] Khafaji, N. J. A. and R. M. A. Zubaedi (2013) The hematological and clinical changes in rabbits exposed to powder of dried leaves of (*Lantana camara*) under experimental conditions. AL-Qadisiya Journal of Vet. Med. Sci. Vol. 13 No. 2.

[10] Krishnamurthy Vinoth Kumar, Dawood Sharief Sultan, Rajkumar Raman Ilango Balakrishnan and Sukumar Ethirajan (2011), effects of *lantana aculeata* root extract on liver enzymes in rats International Journal of Pharmaceutical Studies and Research. Vol II, PP,28-31.

[11] Kumar, M. Surendra, M. Lalitha, N. Astalakshmi and G. Babu (2011) Hepatoprotective activity of *Enicostemma axillare* (LAM) rayan in *Lantana camera* LINN induced hepatotoxicity. Int. J.Pharm. ISSN.: 2249-1848.

[12] Mello, F. B., D. Jacobus, K.C. de Carvalho and J. R. de Mello (2003) Effects of *Lantana camara* (Verbenaceae) on rat fertility. Vet. Hum. Toxicol., 45 (1):20-3.

[13] Mello F.B., D Jacobus, K Carvalho, R.B. Joa˜o and Mello (2005) Effects of *Lantana camara* (Verbenaceae) on general reproductive performance and teratology in rats. Toxicon 45: 459–466.

[14] Moura M.Z.D, T.M.A. Alves, G.L.G. Soares and R.M. dos Santos Isaias (2009) Intra-specific phenotypic variations in Lantana camara leaves affect host selection by the gall maker Aceria lantanae. Biochemical Systematics and Ecology 37: 541–548. [15] Palmer W.A., B.W. Willson and K.R. Pullen (2000) introduction, rearing, and host range of *Aerenicopsis championibates* (Coleoptera: Cerambycidae) for the Biological Control of *Lantana camara* L. in Australia. Biological Control 17: 227–233. [16] Parimoo H.A., R Sharma, R. D. Patil, O. P. Sharma, P. Kumar and N. Kumar (2014). Hepatoprotective effect of Ginkgobiloba leaf extract on lantadenes-induced hepatotoxicity in guinea pigs. *Toxicon,* 81: 1-12.

[17] Pereira J.M., R.W. Barreto, C.A. Ellison and L.A. Maffia (2003) Corynespora cassiicola sp. lantanae: a potential bio control agent from Brazil for *Lantana Camara.* Biological Control 26: 21-31.

[18] Pour, B. M. and S. Sasidharan (2011) In vivo toxicity study of *Lantana camara.* Asian Pac. J. Trop Biomed. 1(3): 230–232.

[19] Sharma O.P., S Sharma, V. Pattabhi, S. B. Mahato and P. D. Sharma (2007) A Review of the Hepatotoxic Plant *Lantana camara.* Critical Reviews in Toxicology 37: 313-352.

[20] Sharma O.P., HPS Makkar and R.K. Dawra (1982) Biochemical effects of the plant *Lantana camara* on guinea pig liver mitochondria. Toxicon 1982; 20: 783-786.

[21] Shetty, S.N., S. Mengi, R. Vaidya and A.D. Vaidya (2013) A study of standardized extracts of *Picrorhiza kurroa* Royle ex Benth in experimental nonalcoholic fatty liver disease. Ayurveda Integr. Med., 1(3): 203–210.

[22] Snedecor, G. W. and W. G. Cochran (1994) Statistical Methods. 7th Edition, The Lowa state University Press, Ames, Iowa.

[23] Totland O., P. Nyeko, A.L. Bjerknes, S.J. Hegland and A Nielsen (2005) Does forest gap size affects population size, plant size, reproductive success and pollinator visitation in *Lantana camera*, a tropical invasive shrub? Forest Ecology and Management 215: 329–338.