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ASSESSMENT OF TOXICITY OF *PARTHENIUM HYSTEROPHORUS* LINN. LEAF EXTRACT ON LIVER BIOCHEMISTRY OF *RATTUS RATTUS*

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Parthenium hysterophorus Linn., an annual herb popularly known as congress grass, is a member or family Asteraceae. The *Parthenium* leaf extract was orally administered to *Rattus rattus*, at 400 mg/kg b.wt. for acute and 13.33 mg/kg b.wt. for sub-chronic (thirty days) treatment to study its impact on hepatobiochemical parameters. The leaf extract caused a significant fall in acute, and non significant rise after 3 and 30 days of subchronic intoxication. The levels of cholesterol and total lipids were registered at an elevated level after both the treatments. The observed hepato-biochemical changes are suggestive of liver dysfunction and additional mode of action of *Parthenium* leaf extract.

Keywords : Liver cholesterol; Liver glycogen; Liver total lipid; *Parthenium hysterophorus* Linn; *Rattus rattus*.

Parthenium hysterophorus Linn., an annual herb of neotropical origin which now has a pantropical distribution[1], belongs to family Asteraceae. *Parthenium* is an exotic weed popularly known as congress grass, carrot weed, gajar ghas, ramphool, fever few etc. It has been introduced in India about five decade back in mid fifties[2] and has spread over an area of about 2,05,000 hectares[3]. Nowadays it can be easily observed on waste lands, railway lines, highways, marshy lands, pond sites, canal ditches, forest and agricultural land associated with every crop[4]. *Parthenium* has already been reported as a medical hazard causing allergic contact dermatitis, asthma, bronchitis and hay fever in man and live stock[5].

Parthenium leaf contains non-alkaloid, non-glycosidic sesquitenpene lactone parthenin (α-methylene-γ-lactone) of pseudoguainolide class[6]. Distribution of parthenin in different parts of *Parthenium hysterophorus* shows that leaf contains maximum amount *i.e.* 3.40 percent of wet weight as compared to other parts of the plant[7].

Although *Parthenium* has adverse effect on man, cattle and plants, it has also been regarded as beneficial plant. It is used in various afflictions like fever, anemia, hepatic ambiosis, dysentry and purification of blood[8]. *Parthenium* has potential use in compost and green manure value[9]. Therefore, study was under taken to assess the toxicity of *Parthenium* leaf extract on liver biochemistry of *Rattus rattus*.

Plant Material : Plants of *Parthenium* were collected from M.S.J. College Campus, vicinity of Keoladeo National Park and residential colonies of Bharatpur, Rajasthan (India) in the month of August and September, when there was luxuriant growth of plant after rainy season. The leaves were dried at room temperature for fifteen days. Dried leaves were ground in mixer grinder to make fine powder. The powder was mixed with acetone and extraction was carriedout with the help of a soxhelat apparatus for forty eight hours. A brownish sticky resinous material was obtained. The sub lethal dose were prepared by adding distilled water.

Experimental Animal : Colony of healthy *Rattus rattus* were developed and the animals were maintained in metal cages under controlled temperature 25°± 5°C, relative humidity 65 ± 5% and photoperiod 12 hours / day. The rats were fed on Gold Mohar rat feed (23.5% protein, 5% fat and 4.5% fiber) purchased from Hindustan Lever Ltd., Calcutta. The water was provided *ad libitum.*

Experimental Protocol : The rats of almost same weight, 225±10 gm, were selected randomly irrespective of age and sex. The *Rattus rattus* were grouped into five sets having six individuals in each set. One set for acute study and four sets for subchronic studies. The control set of six rats was run simultaneously for acute and subchronic treatments.

The doses were selected after determining LD_{50} by the log probit analysis method[10]. The LD_{50} was calculated as 451.15 mg/kg. b. wt. through oral route of exposure. The *Parthenium hysterophorus* leaf extract was orally administered to *Rattus rattus* at 400 mg/kg. b. wt. for acute and at 13.33 mg/kg. b. wt. for each subchronic treatment by stomach tube feeding. The vehicle distilled

Table 1. Body weight, liver weight and liver weight / body weight ratio in *Parthenium* leaf extract oral administration in *Rattus rattus.*

Treatment	Days	Control			Treated		
		Body Weight	Liver Weight		Body Weight	Liver Weight	
		Wt (g)	Wt (g)	Liver body wt ratio (g)	Wt (g)	Wt (g)	Liver body wt ratio (g)
Acute	1	227.10 ± 4.20	6.35 ± 0.35	0.018 ± 1.12 x 10^{-3}	215.90 ±4.26 A	7.26 ± 0.27	0.021 ± 2.01 x 10^{-3} A
Subchronic	3	210.60 ± 5.54	6.00 ± 0.17	0.021 ± 2.05 x 10^{-3}	201.05 ± 4.48	6.71 ± 0.20	0.023 ± 1.95 x 10^{-3} NS
	7	215.15 ± 5.14	6.12 ± 0.25	0.019 ± 1.95 x 10^{-3}	203.10 ± 5.37	6.77 ± 0.30	0.022 ± 1.76 x 10^{-3} NS
	15	212.00 ± 5.32	6.14 ± 0.21	0.020 ± 1.85 x 10^{-3}	197.51 ± 3.74	7.02 ± 0.22	0.021 ± 1.98 x 10^{-3} NS
	30	210.20 ± 4.97	6.17 ± 0.25	0.022 ± 1.45 x 10^{-3}	195.10 ± 3.73	7.54 ± 0.32	0.025 ± 1.68 x 10^{-3} A

Values as mean ± S.E., Six rats in each group
A : Significantly different from controls at P<0.01 level; B : Significantly different from control at P<0.02 level;
NS : Non-significant

Table 2. Liver biochemical parameters after *Parthenium* leaf extract oral administration in *Rattus rattus.*

Treatment	Days	Glycogen (Mg/g)		Cholesterol (Mg/g)		Total Lipid (Mg/g)	
		Control	Treated	Control	Treated	Control	Treated
Acute	1	15.52 ± 0.76	12.70 C ± 0.91	24.40 ± 1.94	41.61 C ± 1.95	02.12 ± 0.06	03.31 D ± 0.09
Subchronic	3	15.57 ± 0.90	16.98 * ± 0.79	24.51 ± 2.02	31.13 * ± 2.27	02.72 ± 0.05	03.26 A ± 0.08
	7	15.65 ± 0.80	14.21 * ± 0.76	24.86 ± 2.17	31.90 * ± 2.06	03.14 ± 0.05	03.57 * ± 0.09
	15	15.79 ± 1.01	13.63 * ± 0.93	24.80 ± 2.15	32.81 * ± 2.24	3.15 ± 0.05	03.90 A ± 0.11
	30	15.58 ± 1.12	16.20 * ± 0.87	24.62 ± 2.22	32.31 * ± 2.13	02.64 ± 0.15	03.52 C ± 0.08

Values are mean ± S.E. of 6 determinations, A : P<0.05, B : P<0.02, C : P<0.01, D:P<0.001,
* = Non significant

water was given to control set of rats.

The rats were reweighed and excised out after the termination of the experimental period *i.e.* 1, 3, 7, 15 and 30 days. Livers were weighed and processed for biochemical studies. Change in body weight and liver weight to body weight ratio was determined. Liver glycogen, cholesterol and total lipids were estimated by the standard methods[11-13]. Data were subjected to statistical evaluation using student's t-test. Statistical significances were used at $P<0.01$, $P<0.02$ and $P<0.05$ levels.

On oral administration of an acute dose of *Parthenium* leaf extract rats developed onset of toxicity within 5-7 minutes, exhibiting hypersalivation and tremors. Subsequently, the sign of maximal severity including convulsions, nofeeding, anorexia, ejection of food with equal amount of water (diarrhoea), pulmonary dysfunction (as revealed by labored breathing) leading to leg weakness (body on half paw) were evident within 15-30 minutes and lasted about three hours. However, the toxicity manifestations exhibited by sub-chronically treated rats were of mild severity and lasted about one hour. These signs are suggestive of both central and peripheral origin[14-23].

A significant reducation in body weight, after acute treatment, has been observed as compared to controls (Table 1). However, increase (significant) in liver body weight ratio after acute and sub-chronic (30 days) treatment was evident (Table 1). A significant fall in glycogen after acute and non-significant rise after days 3 and 30 has been observed (Table 2). The levels of cholesterol and total lipids were registered at an elevated level after both the treatments (Table 2).

Loss in body weight of rats might be due to anorexia, food avoidance and diarrhoea caused by *Parthenium* leaf extract, as has also been observed in buffalo calves[19]. The weight of liver in rats was markedly affected. The change may be due in part, to a direct effect of *Parthenium* leaf extract on liver weight and in part to an indirect effect due to general growth depressing effects of the extract. The indirect effect of *Parthenium* leaf extract on growth could cause change in liver weight[21,23]. Since the body weight decreases with the increase in liver weight, an increase in liver to body weight ratio is evident and gain support[22].

The depletion in liver glycogen may be attributed to anorexia, labored breathing and diahhroea as a result of which demand for glucose may increase in treated rats. During such conditions glycogenolysis might have increased to fulfill the glucose requirement of the rats and is in close affirmation to Ahmed *et al.*[22]. Further, the reduction in hepatic glycogen can also be due to the lost capacity of liver to mobilise glucose as glycogen following pathophysiological changes (increased liver weight) as is evident in the present investigation and gain support by other studies[21,23].

Increase in total lipid and cholesterol level in liver as a result of *Parthenium* leaf extract treatment probably indicate the impaired lipid and cholesterol metabolism. Since, liver is the major organ of biosynthesis of cholesterol and responsible for mobilization and excretion, the high levels of cholesterol and total lipid in the liver of rats show that the process is highly interrupted leading to accumulation of cholesterol and total lipid in liver.

The lipids and cholesterol are carried by lipoproteins, forming very low density lipoproteins (VLDL) from the liver, to different tissues of the body. The elevation in total lipid and cholesterol level may further be attributed to lower level of lipoprotein in the liver of rats after *Parthenium* leaf extract treatment. It is evident that acute and sub-chronic (30 days) treatment is more prominent.

In conclusion, *Parthenium* leaf extract intoxication to rats lowers glycogen and increases cholesterol and total lipid levels in liver.

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