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Research Article

TOXICITY STUDIES OF EXTRACT OF *MORINDA CITRIFOLIA*

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ABSTRACT

The present investigation was carried out to evaluate the safety of methanolic extract from leaves by determining its potential toxicity after acute and sub acute administration in mice. For the acute study, extract of *Morinda citrifolia* was administrated to mice in single doses given by oral route. General behavior adverse effects and mortality were determined up to7 days. In the Sub acute study, the extract was administered orally at doses of 200 and 400 mg/kg for 28 days to mice Biochemical and hematological parameters were determined at the end of 28 days of daily administration. The studies on sub acute toxicity reveals that no mortalities or evidence of adverse effects have been observed in mice following acute oral administration at the highest dose of 2000mg/kg crude extract of . In sub acute toxicity study daily oral administration of methanolic extract of 200 and 400 mg/kg *Morinda citrifolia* body weight of extract of *Morinda citrifolia* for up to 28 days did not result in death or significant changes in body weight, Hematological and Biochemical parameters were done and tabulated.

Keywords: Extract of *Morinda citrifolia*. Toxicity Studies.

INTRODUCTION

Nature has best owned upon us a very prosperous botanical prosperity and a large number of diverse types of plants cultivate wild in different parts of our country. In India, the use of different parts of plant *Morinda citrifolia* Experimental screening method is important in order to ascertain the safety and efficacy of traditional and herbal products and also to establish the active component of the medicinal herbs.

MATERIALS AND METHOD

Collection of Plant Materials

The plant material of *Morinda citrifolia* were collected from different parts of Andhra Pradesh and were authentified.

Experimental animals

Healthy mice weighing 20-35 gm were acclimatized for 14 days. The animals were housed under standard conditions and room temperature (25±2oC). During the acclimatization period of 14 days, animals were observed for general condition every day and weighed on the next day of arrival and on the last day of acclimatization.

Acute toxicity study

The toxicity study as carried out using mice (20-35 g).The acute toxicity studies were conducted as per the OECD guidelines 420(OECD 2000) where the limit test dose of 2000 mg/kg was used. The animals were divided into one control group and one treated group, each group consisting of ten animals (10 animals).

Behavioral signs like apathy, reduced locomotor behavior were observed.

Sub acute-Toxicity Study

Healthy adult mice weighing 20-30 gm were divided in to 3 groups of 6 animals each and were housed under standard conditions and room temperature (25±2oC). The control animals (Group-I) received 0.5ml of vehicle alone and the other two groups(Group-II &III) have received the plant extract for 28 days at doses of 200,400 mg/Kg body weight respectively.

Observations

Toxic manifestations and mortality were monitored daily were recorded every 7 days till the end of the study.

Hematological Biochemical Studies

At 28thday animals were fasted for 12 hrs, they anaesthetized with ether and blood was collected from orbital sinus in heparinized tube for the analysis of hematological parameters using Mythic18, which included Hemoglobin, Red blood cell count, white blood cell count, platelet, reticulocyte, neutrophils, Eosinophils, lymphocytes, monocytes, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin concentration, mean corpuscular hemoglobin

and was centrifuged at 4000 rpm at 4o C for 10 minutes to obtain the serum for biochemical estimations. Both the plasma and serum were stored at -20o C until analyzed for biochemical parameters. The serum was assayed for bilirubin, serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, serum alkaline phosphatase, serum proteins, serum total albumin, serum total globulin, serum cholesterol, serum triglycerides, creatinine, blood urea nitrogen, calcium, phosphorus and electrolytes like sodium, potassium and chloride using auto analyzer. Immediately after collecting the blood samples, animals were then sacrificed by ether anesthesia.

Statistical analysis

All the results are expressed as mean value ± SEM Within group comparisons were done recorded.

Acute Toxicity Study

The acute toxicity study was conducted as per the OECD guidelines 420, where the limit test dose of 2000mg/Kg was used. The observations are presented in Table. Test substance related mortality was observed at 2000mg/Kg and throughout the observation period there were no significant changes in the body weight and treatment related change like respiration rate and heart rate. Persistent treatment related changes were observed in behavioral signs viz apathy, reduced locomotor behavior but regained after 24 hrs. Consequently, 2000 mg/Kg of three plant extracts found safe with less toxic effect.

Table: Observations of Acute Toxicity of *Morinda citrifolia*

Animal no	Dose mg/Kg	Body wt.(gm)	Apathy	Ataxia	Circling	Compulsive behavior	Excitability	Locomotor behaviour	Moribund	Drinking	Edema	Paralysis	Reflexes	Heart rate	Respiratory rate	Pruritis	Eyelid closure	Diarrhea	Depression	Body wt. changes	Hunched/stiff posture
A1	200	31	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A2	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A3	200	35	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A4	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A5	200	32	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A6	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A7	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A8	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A9	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
A1	200	30	+	-	-	-	-	+	-	-	-	-	-	N	N	-	N	-	-	-	-
C1	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C2	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C3	C	35	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C4	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C5	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C6	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C7	C	35	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C8	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C9	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N
C1	C	30	N	N	N	N	N	N	N	N	-	-	N	N	N	N	N	-	-	N	N

+ Significant changes - not observed/no change noticed C- Control N- normal

Sub acute toxicity study

The methanol extract of *Morinda citrifolia* at dose of 200,400 mg/kg orally for every 24 hrs for 28 days did not produce any mortality in tested animals. No sign of observable toxicity was detected during the experimental period. Progressive increase in body weight at dose of 200,400 mg/kg of mice during 28 days of administration of methanolic extract of the plant indicate the improvement in the nutritional state of the animal.

Hematological and Biochemical parameters

The effect of extract of *Morinda citrifolia* hematological parameters of the experimental and control mice is presented in table . All the tested hematological parameters such as hemoglobin, R.B.C, Platelet count, Reticulocyte count, Mean corpuscular volume, mean corpuscular hemoglobin concentration, Percent of Neutrophils, Lymphocytes and Monocytes, Packed cell volume and mean corpuscular hemoglobin remained within physiological range throughout the treatment period (28 days).

Table: Hematological parameters after 28 days oral treatment with methanol extracts Values mean S.E.M of *Morinda citrifolia*

Parameters	Group-I	Group-II	Group-III
Hemoglobin G%	15.41±0.12	15.25±0.21	15.33±0.19
RBC X 106/cmm	8.26±0.12	8.28±0.49	8.67±0.13
WBC X 103/ cmm	4.01±0.11	5.31±0.21	3.91±0.31
PLT lakhs/cmm	5.71±0.21	6.2±0.04	6.34±0.11
PLT lakhs/cmm	0.95±0.19	1.01±0.12	1±0.35
Neutrophil %	20.4±3.41	21.68±2.21	24±7.22
Lymphocyte%	78.16±4.19	77.16±5.41	74.81±7.32
Monocyte %	1.32±0.41	1.18±0.32	1.16±0.21
PCV%	45.81±1.29	45.32±2.19	47.14±1.28
MCV Fl	54.23±1.37	54.49±2.22	53.77±1.17
MCH pg	18.28±0.37	18.2±0.61	18.1±0.25
MCHC gm/dl	33.77±0.12	34.05±0.25	33.75±0.34

The data for the biochemical parameters in the treated and control mice are presented in Table Sub acute oral administration of *Morinda citrifolia* extract (daily for 28 days) did not cause any significant changes in some biochemical parameters including serum bilirubin, Serum total proteins, serum total albumin, serum total globulin, serum cholesterol, serum triglyceride, sodium, potassium, calcium and phosphorus and the activity of the marker enzymes of the liver (Serum glutamic oxaloacetic Transaminase, Serum Glutamic pyruvic Transaminase, Serum alkaline phosphatase)

Table: Effect of treatment with extracts on biochemical parameters Values are expressed as mean ± S.D. The * symbol represent the statistical significance S.E.M of *Morinda citrifolia*

Parameter		Group-I	Group-II	Group-III
SGOT IU/L		123.17±22.12	115.83±22.22	
SGPT IU/L		80.83±11.32	77.66±13.69	90.5±13.33
ALP IU/L		581.66±86.39	539.83±47.28	500.83±128.31
BILI mg/dl		0.43±0.099	0.42±0.19	0.5±0.18
PRO g/dl		5.1±0.37	5.12±0.22	4.97±0.31
ALB g/dl		2.33±0.11	2.4±0.21	2.33±0.28
GLB g/dl		2.75±0.18	2.61±0.22	2.87±0.91
Cholesterol mg/dl		82.83±4.15	82.67±5.82	82.67±4.31
TG mg/dl		90.67±3.29	94.17±4.22	93.83±8.14
Electrolytes	Na mEq/L	150.48±7.21	158.68±2.72	150.12±10.22
	K mEq/L	6.8±1.12	6.78±0.32	5.96±0.64
	Cl mEq/L	116.82±6.82	130.45±6.82	115.47±8.21
	Ca mg/dl	8.5±0.22	8.53±0.32	9.88±0.73
	P mg/dl	7.03±0.21	6.77±0.32	7.18±0.21
BUN mg/dl		18.35±8.21	9.15±0.34	11.3±2.21
Creatinine mg/dl		0.33±0.01	0.25±0.05	0.32±0.12

RESULTS AND DISCUSSION

Herbal medicine is still the mainstay of about 75-80% of the world population, mainly in the developing countries for primary health care. Herbal medicines have received greater attention as an alternative to clinical therapy and the demand for these remedies has currently increased. The increase in number of users as oppose to the scarcity of scientific evidences on the safety of the medicinal plants have risen regarding toxicity and detrimental effects of these remedies. The medicinal plants commonly contain various bioactive principles which have the potential to cause beneficial and/or detrimental effects. Experimental screening method is important in order to ascertain the safety and efficacy of traditional and herbal products and also to establish the active component of the herbal products .The results of the acute toxicity reveals that there was no mortality observed up to the maximum dose level of 2000mg/kg b.wt of the extract administered orally, which is the single high dose recommended by OECD guidelines423 for testing acute toxicity. No changes attributable to treatment were found in body weight, respiration rate, heart rate. Treatment related changes observed in behavioral signs vizapathy, reduced locomotor behavior but regained after 24 hr may be due to the effect of solvent.

Thus the present investigation reveals that combined methanolic extract of *Morinda citrifolia* does not cause any acute toxicity. Generally the reduction in body weight gain and internal organ weights is a simple and sensitive index of toxicity after exposure to toxic substances. In sub-acute toxicity study mice treated with 200,400 mg/kg doses of methanolic extract of *Morinda citrifolia* of had a progressive increase in body weight. The increase in weight was not significantly different from that of the control. The progressive increase in body weight at dose of 200,400 mg/kg of mice during 28 days of administration of methanolic extract of *Morinda citrifolia* may indicate the improvement in the nutritional state of the animal. The growth response effect could be as a result of increased food and water intake. The hematopoietic system is one of the most sensitive targets for toxic chemicals and an important index of physiological and pathological status in human and animal the hematological status after 28 days of oral administration of methanolic extract of *Morinda citrifolia* was also assessed. The white blood cell was found to be significantly increased in Group –II and decreased in Group-III. With the exception of a transient change in WBC count there were no significant alterations in the hematological parameters.

Transaminases (GOT and GPT) and ALPs are good indices of liver damage. There were no deleterious changes found in the level of transaminases and ALPs in serum of treated groups with control animals. Equally, there also was no marked change in creatinine in these two doses when compared to the control. And creatinine is known as an effective indicator of renal function and any rise in creatinine levels is observed if there is marked damage to functional nephrons. Thus, the results recorded in this study suggest that *Morinda citrifolia* extract did not affect the renal function. Clearly, this only serves as a preliminary test and that for a better estimation of renal function a creatinine clearance test is required. The liver is the site of cholesterol disposal or degradation and the major site of synthesis. Since, no significant changes were observed in cholesterol levels in this study, it suggests *Morinda citrifolia* extract had no effects on the cholesterol metabolism of the mice. All other biochemical parameters such as total protein, albumin and globulin were remained normal without any significant difference .The levels of electrolytes maintain the body fluid equilibrium. No significant changes were observed in the electrolytes levels, except Calcium, Chloride and blood urea nitrogen. Calcium, Chloride and blood urea nitrogen were significantly changed in treated animals when compared with control group suggesting that the extracts was relatively low or non-toxic under study conditions.

Furthermore gross examination of internal organs from treated and control animals showed normal Architecture, suggesting no detrimental changes and morphological disturbances caused due to the administration of extract of *Morinda citrifolia* for 28 days.

CONCLUSION

In conclusion, this study provides the very valuable data on the acute and sub acute toxicity profile of methanolic extract of *Morinda citrifolia* that should be very useful for any future in vivo and clinical study of these plants as medicine. *Morinda citrifolia* was found to be less toxic when oral acute and sub acute toxicities in mice were performed. Chronic toxicity, are necessary to further support the safe use of this herb. These results showed that the use of the extract of *Morinda citrifolia* is safe and explained the extensive utilization of the plant in traditional medicine.

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