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Original Research Article

Acute & Sub Acute Toxicity Studies of Hydroalcoholic Extract of Solanum Xanthocarpum Whole Plant

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Abstract:
The present study is designed to evaluate the safety of aqueous: methanolic (40:60) extract of *Solanum xanthocarpum* whole plant (SXWP) by determining its potential toxicity after acute and subacute administration in male wistar albino rats. Medicinal plants might deliver a few organic activities in people, but generally very little is known about their toxicity. Though, safety should be the overriding criterion in the selection of medicinal plants for use in healthcare systems, several drugs produce acute and obvious signs of toxicity which are used in the traditional system of medicine. The purpose of toxicity testing is to provide adequate database to make decision concerning the toxicology properties of chemicals and commercial products and to decide whether a drug or chemicals will be safe or not.
Results concluded that SXWP extract produce beneficial effect on some blood parameters upon oral administration. Biochemical parameter such as total protein content was changed which may not be beneficial but lowering of lipid profile can be beneficial for long term use. There were no significant change in the other serum parameters may proved its long term use, the kidney parameters too remain unchanged. Further studies are needed to verify the effect of low, medium and high dose for chronic administration of SXWP extract.
Keywords: Methanolic, Extract, *Solanum xanthocarpum*, Toxicity, Chronic, Acute

Introduction

Medicinal plants might deliver a few organic activities in people, but generally very little is known about their toxicity. Though, safety should be the overriding criterion in the selection of medicinal plants for use in healthcare systems, several drugs produce acute and obvious signs of toxicity which are used in the traditional system of medicine. Plants produce bioactive mixtures which go about as protection systems against hunters and simultaneously, might be harmful in nature. In this way, it has become basic to evaluate the wellbeing of plants utilized for therapeutic purposes for conceivable toxicity.

Plants contain hundreds of constituents and some of them may elicit toxic side effects. A

number of studies exist reporting the toxic effect of herbal medicines. Therefore efficacy and safety study should be performed on these herbs

Toxicity:

Toxicology is described as any risky impact of a chemical or medication on a target organism. Acute and sub-acute toxin has been described by means of colorful professionals. Toxin can be acute, sub persistent, or recurring acute toxin involves risky goods in an organism via a unmarried or brief- term exposure. Sub-acute toxin is the functionality of a toxic substance to beget goods for in addition than one time however decreases than the continuance of the uncovered organism. Routine toxin is the capability of a substance or admixture of substances to beget dangerous items over a prolonged duration, generally upon repeated or nonstop publicity, once in a while lasting for the whole life of the uncovered organism.

The purpose of toxin testing is to give acceptable database to make decision concerning the toxicology parcels of chemicals and marketable products and to decide whether a medicine or chemicals will be safe or not. The purpose of the safety pharmacology core battery is to probe the goods of the test substance on vital functions. In this regard, the cardiovascular, respiratory and central nervous systems are generally considered the vital organ systems that should be studied in the core battery

Types of Toxicity

Acute toxicity

In acute toxin study, creatures are given single doses of a medicine. The most common study design is to give groups of rats or mice (similar as 5 per sex) single treatment over a wide range of doses and also observe them for 24 hours for survival and for any physical of behavioral signs of toxin.

Aim of acute toxicity:

- To determine LD50 value
- Route of administration

Table No.1: Classification of chemicals on the basis of LD50 values as mg/kg

United state	Toxic 1	Toxic 2	Toxic 3	
Solids	<5	<50	<500	
Liquids	<5	<50	<2000	
WHO	Extremelyhazardous	Highly hazardous	Moderatedtoxic	Slightly toxic
Solid	<5	<50	<500	<5000
Liquids	<20	<200	<2000	
European Communities	Very toxic	Toxic	Harmful	
	<25	<200	<2000	
USA	supertoxic	Highly toxic	Very toxic	Moderately toxic
	<5	<50	<500	<5000

Sub-acute toxicity: These are designed to examine the adverse goods performing from repeated exposure over a portion of average lifetime of an experimental beast. In sub-acute toxin two species of creatures are cured daily. The starting cure is at around the anticipated remedial cure and it's increased every two to three days until poisonous signs are observed. Hematological and biochemical parameters are carried out and the blood situation of the emulsion is also estimated to insure its immersion. The creatures are also maintained at the maximum permitted cure for a period of two to three weeks, also killed and

subordinated to complete pathological and histological examinations.

- The primary goal of repeated dose toxicity studies is to characterize the toxicological profile of the test compound.
- Identification of potential target organs of toxicity and exposure/response relationships and may include the potential reversibility of toxic effects.
- This information should be part of the safety assessment to support the conduct of human clinical trials and the approval of marketing authorization

Chronic toxicity

Chronic toxicity study is carried out by diurnal dosing of the combination in two species, one rodent and one non rodent for six months or further.

Aim of chronic toxicity study

- The identification of the hazardous properties of a chemical.
- The identification of target organs, characterization of the dose: response relationship
- Identification of a no-observed-adverse-effect level (NOAEL) or point of departure for establishment of a Benchmark Dose (BMD).
- The prediction of chronic toxicity effects at human exposure levels, provision of data to test hypotheses regarding mode of action.

2. Materials and Method

Selection of Plant material:

The plant has been selected on its availability and folk use of the plant.

Collection of plant material

Every part of the plant may contain active secondary metabolites, like bark, leaves, flowers, roots, fruits and seed. Fresh and healthy, disease free plant of *Solanum xanthocarpum* were collected in month of December from ruler area of Sagar (M.P.) and authenticated by Dr. Prof. Pradeep Tiwari, Department of Botany, Dr. Hari Singh Gour Central University, Sagar (MP), India.

Extraction of dried plant

After collection and authentication the plant material will be dried under controlled condition and will be extracted with aqueous: methanolic (40:60) in soxhlet apparatus. All the alcohol and water will be removed. The extract obtained will be concentrated under vacuum. The gravimetric yield of the extract will be noted.

Phytochemical screening:

Aqueous:methanolic extract of *Solanum xanthocarpum* will be examined chemically for the presence of alkaloids, flavonoids, carbohydrates, glycosides, volatiles oils etc.

Safety Evaluation of collected extract

Acute toxicity studies:

The acute toxicity studies will be conducted as per OECD guidelines 420 (2001). Animals: Wistar /Sprague Dawley albino rats/mice of either sex will be used.

TG 420: Fixed Dose procedure:

The test consists in dosing groups of animals either sex in a stepwise procedure using the fixed doses of 5, 50, 300 and 2000 mg/kg (exceptionally an additional dose of 5000 mg/kg may be considered). The initial dose level is selected as the dose expected to produce some signs of toxicity without causing severe toxic effects or mortality based on in vivo/in vitro data (if no information exists the starting dose will be 300 mg/kg). Further groups of animals may be dosed at higher or lower fixed doses, depending on the presence or absence of signs of toxicity. This procedure continues until the dose causing evident toxicity is identified.

Sub-acute toxicity studies

Subacute oral toxicity will be carried out according to OECD guidelines 407.

The test substance is orally administered daily in graduated doses to several groups of

experimental animals, one dose level per group for a period of 28 days. During the period of administration the animals are observed closely, each day for signs of toxicity. Animals which die or are killed during the test are necropsied and at the conclusion of the test surviving animals are killed and necropsied.

- **Body weight and food/water consumption**

All animals are weighed at least once a week, and the food consumption is monitored at least weekly

- **Hematology**

The following hematological parameter will be estimated at the end of the test period: haematocrit, haemoglobin concentration, erythrocyte count, total and differential leucocyte count,platelet count,blood enzyme troponin,blood urea nitrogen and a measure of blood clotting time/potential.

- **Blood samples:**

The blood sample is collected from retro orbital plexus and subjected to biochemical analysis for the estimation of the following serum parameters

- **Biochemical parameters:**

Glucose, alanine aminotransferase (ALT), aspartase aminotransferase (AST), creatinine, uric acid (UA), bilirubin, urea, cholesterol, triglycerides (TG) and total protein estimated by commercial kits.

- **Urine parameters:**

All the animals will place in metabolic cages to collect urine samples.

Urine volume will measured and analyzed for, glucose, specific gravity, pH, protein, ketones, K^+, Na^+, calcium, chloride, bicarbonate phosphate, blood urea nitrogen and creatinine.

- **Histopathology**

The animals were sacrificed and the tissues obtained from their heart, lung, kidney, liver, spleen and brain were subjected to microscopical analysis.

3. Result And Discussion

- **Plant Extract**

The extract of whole plant of *Solanum xanthocarpum* was semisolid and appeared as green in colour and the gravimetric yield was found to be 20% (Table.2)

Table 2: Description of plant extract

S. No.	Appearance	Gravimetric Yield %
1.	Semi solid green colored extract	20%

- **Preliminary Phytochemical Screening**

The preliminary phytochemical screening of the *Solanum xanthocarpum* whole plant extract revealed the presence of Carbohydrate, Flavanoids, Alkaloids, Glycosides, Saponins, Triterpenoids and Phenolic compounds (Table 3).

Table 3: Preliminary phytochemical screenning of *Solanum xanthocarpum* Whole Plant Extract (SXWPE)

S No	Category	Chemical Test	Observation	Results*
1.	**Alkaloids**	Mayer's	Yellow cream colored complexwas formed	+
		Hager's	Yellow colored precipitate was not formed	-
2.	**Carbohydrates**	Xanthoprotein	Violet colored ringappeared at the junction.	+
		Fehling	Brick red precipitatewas not formed	-
3.	**Glycosides**	Legal test	Red color was not appeared	
		Baljets test	converted yellow to orange color	+
4.	**Phytosterols and triterpenoids**	Liebermann's test	Blue color wasappeared	-
		Sakowaski test	Red colour in chloroform layer and yellow in lower layer was appeared	+
5.	**Proteins and amino acids**	Ninhydrin test	Purple color was appeared	+
6.	**Phenolics and tannins**	Lead acetate test	Yellow precipitate was formed	+
7.	**Flavanoids**	Alkaline reagent test	Yellow color precipitate wasformed	+
8.	**Saponins**	Foam test	Froathing appeared on shaking	+

* The (+) sign indicate presence of compound and (-) sign indicate the absence of compound

❖ **Acute Toxicity Study**

Acute toxicity studies revealed that the whole plant extract was safe up to dose level of 2000 mg/kg body weight. There were no changes in behaviour and no lethality or any toxic reaction or morbidity was observed up to the end of the study. (Table 4)

Table 4: Acute toxicity study of SXWP extract

S.No.	Treatment dosemg/kg	Dead rat/total rat	% mortality
1.	Vehicle control	0/6	0%
2.	Extract 5	0/6	0%
3.	Extract 50	0/6	0%
4.	Extract 300	0/6	0%
5.	Extract 2000	0/6	0%

❖ **Subacute Toxicity Study**

❖ **Body weight:**

There were no significant difference in body weights of SXWP extract treated groups as compare to control group after 28 days of extract administration and data suggested that the extract did not affect the growth rate of animals. Data was shown in **Table 5** and graphically depicted in **Fig. No. 1**

Table 5 Effect of SXWP extract on body weight

Days	SXWP extract treated groups			
	Group I(control)	**Group II(100mg)**	**Group III(200mg)**	**Group IV(400mg)**
0 day	115.36±9.15	96.94±2.72^{ns}	104.24±5.48^{ns}	105.06±6.46^{ns}
7 day	118.73±9.71	96.80±2.92^{ns}	104.19±5.34^{ns}	105.22±6.32^{ns}
14 day	121.67±9.62	97.18±3.55^{ns}	102.07±5.42^{ns}	106.09±6.35^{ns}
21 day	123.14±9.26	99.05±3.30^{ns}	105.71±4.33^{ns}	105.60±6.11^{ns}
28 day	124.27±8.86	99.91±2.29^{ns}	107.51±4.64^{ns}	106.249±6.27^{ns}

n = 6 rats in each group, values are expressed in mean ± SEMns = non-significant P> 0.05, compared to control group

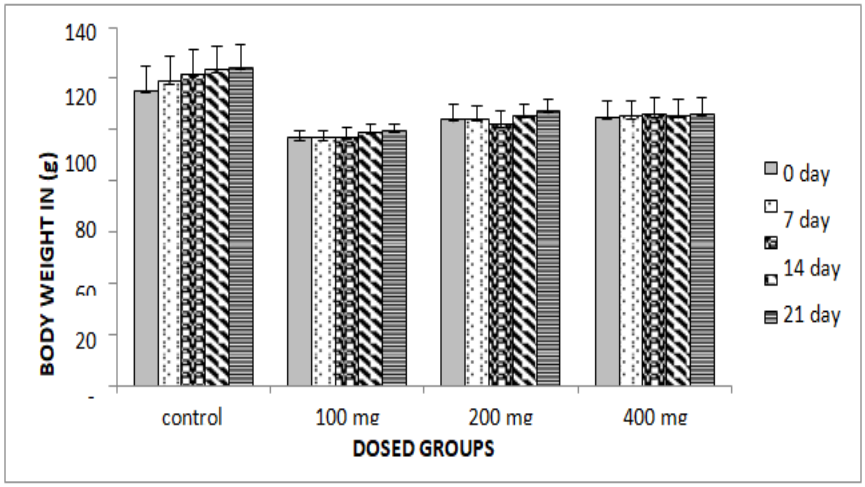


Figure 1: Effect of SXWP extract on body weight of different groups

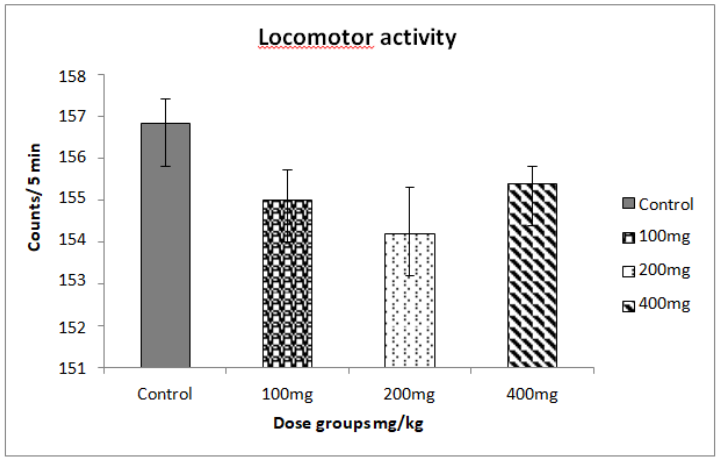
❖ **Screening of CNS parameters:**

❖ **Locomotor activity testing:**

The locomotor activity (counts/5 min) revealed that the whole plant extract did not produce any significant effect in the entire treated group as compare to control group and result suggested that the extract did not significantly stimulate or depress the CNS. **(Table 6 and Fig no. 2)**

Table 6: Effects of SXWP extract on locomotor activity

S.No.	Treatment DoseMg/Kg	Locomotor Activity(Counts/5 Min.)
1	Group I (control)	156.83±0.60
2	Group II (100mg)	155.00±0.73^{ns}
3	Group III (200mg)	154.21±1.12^{ns}
4	Group IV (400mg)	155.40±0.41^{ns}



❖ **Urine parameters**

The urine parameters of all control and SXWP extract treated groups are shown in **(table 7.)** and graphically depicted in **fig. 3, 4.** After 28 days administration of SXWP extract rats at all the dose level did not show any significant change in values of Urea, Uric acid, Total protein, Glucose, Sodium, Potassium, Chloride, Urine Volume and pH except Creatinine level was found to be increased in all the dose level as compared to control group.

Table 7 Effects of SXWP extract on urine parameters

Parameters	**Group IControl**	**Group II(100mg)**	**Group III (200mg)**	**Group IV (400mg)**
Urea (mg/dl)	68.96±1.91	69.72±8.03 ^{ns}	70.59±3.61^{ns}	72.69±4.88^{ns}
Uric acid (mg/dl)	3.01±0.108	4.04±0.618 ^{ns}	3.45±1.03 ^{ns}	3.54±0.8 ^{ns}
Creatinine (mg/dl)	3.68±0.852	7.55±1.20*	8.81±1.02**	8.73±0.17**
T.protein (g/dL)	1.01±0.17	1.07±0.12 ^{ns}	1.20±0.18 ^{ns}	1.38±0.05^{ns}
Glucose (mg/dL)	9.05±0.86	8.05±0.78 ^{ns}	8.55±0.88^{ns}	8.7±0.70 ^{ns}
Calcium (mEq/L)	1.81±0.48	3.29±1.17 ^{ns}	1.66±0.12 ^{ns}	3.66±1.43^{ns}
Chloride (mEq/L)	82.36±6.166	81.32±4.945 ^{ns}	80.43±4.60 ^{ns}	80.86±1.51^{ns}
Potassium (mEq/L)	21.40±3.16	19.50±1.59 ^{ns}	17.66±1.96^{ns}	16.95±2.89^{ns}
Volume	0.86±0.15	0.73±0.040^{ns}	0.7±0.081 ^{ns}	0.71±0.087^{ns}
pH	7.1±0.30	7.0±0.36 ^{ns}	6.3±0.33 ^{ns}	6.5±0.42^{ns}

*P < O.05 significant compared to control group

**p < 0.01 highly significant compared to control group

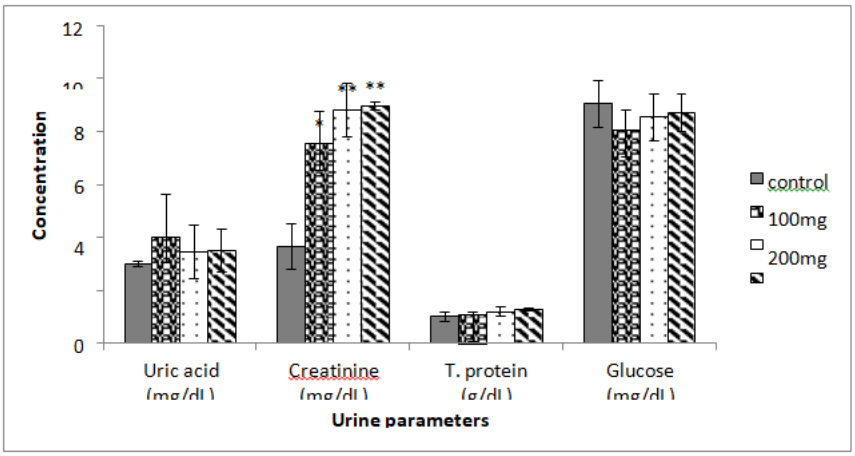


Figure 3: Effect of SXWP extract on urine parameters

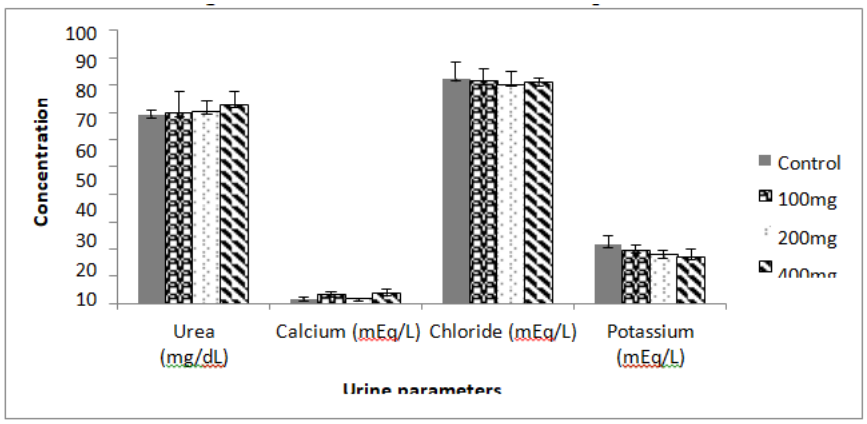


Figure 4: Effect of SXWP extract on urine urea and electrolytes

❖ **Biochemical parameters:**

The biochemical parameters of all the SXWP extract treated group and control group are shown in **table 8** and graphically depicted in **fig. 5, 6, and 7.** After 28 days of treated with SXWP extract there were no significant change in serum Albumin, Globulin, Urea, Uric acid, Creatinine, Direct bilirubin, Total bilirubin, Potassium and Chloride level in comparison to control group. While there were highly significant decrease in glucose and serum total protein in group (III & IV) in comparison to control group. The calcium level was highly significantly increased in group IV while there none significantly changed ingroup II and III in comparison to control group.

Table 8: Effect of SXWP extract on serum parameters

Parameters	Group I (Control)	Group II(100mg)	Group III (200mg)	Group IV(400mg)
T. Protien (g/dl)	5.63±0.59	5.11±0.388 ^{ns}	3.18±0.481 **	3.98±0.209 **
Albumin (g/dl)	3.19±0.482	2.08±0.321 ^{ns}	2.98±0.402^{ns}	2.2±0.609 ^{ns}
Globulin (g/dl)	2.43±0.320	3.03±0.431 ^{ns}	2.00±0.560^{ns}	1.78±0.467 ^{ns}

T.bilirubin (mg/dl)	0.87± 0.043	1.33± 0.33 ^{ns}	1.34±0.27^{ns}	0.94±0.213^{ns}
D.bilirubin (mg/dl)	0.35± 0.04	0.48± 0.19 ^{ns}	0.56±0.15^{ns}	0.61± 0.19^{ns}
ALP (IU/L)	163.92±12.1	151.4±7.52^{ns}	167.8±9.70^{ns}	165.07±6.69^{ns}
SGPT (IU/L)	31.50±1.32	29.45±1.39^{ns}	28.54±2.64	27.62±1.63^{ns}
SGOT (IU/L)	63.26±0.01	66.01±2.90^{ns}	70.22±3.39^{ns}	71.17±1.38^{ns}
Glucose (mg/dL)	74.01±0.335	30.85±2.38**	27.01±2.75**	26.10±1.85**
Urea (mg/dL)	39.31±2.489	36.68 ±0.59^{ns}	37.13±2.80^{ns}	35.33±4.35^{ns}
Uric acid (mg/dl)	4.94± 0.386	4.81± 0.37 ^{ns}	4.29±0.18^{ns}	4.52±0.41^{ns}
Creatinine (mg/dl)	0.52± 0.128	0.49± 0.078^{ns}	0.47±0.076^{ns}	0.46±0.187^{ns}
K (mEq/L)	15.376±2.19	14.10±0.57^{ns}	16.22±1.42^{ns}	18.25±3.55^{ns}
Cl (mEq/L)	101.83±2.26	107.83±1.24^{ns}	110.03±1.29^{ns}	105.21±1.10^{ns}
Ca (mEq/L)	8.663±1.50	8.743±0.70^{ns}	6.19±1.154 ^{ns}	24.09±1.20**

$^{**}p < 0.01$ highly significant compared to control group
$^{*}p< 0.05$ significant compared to control group
ns $P > 0.05$ non-significant compared to control group

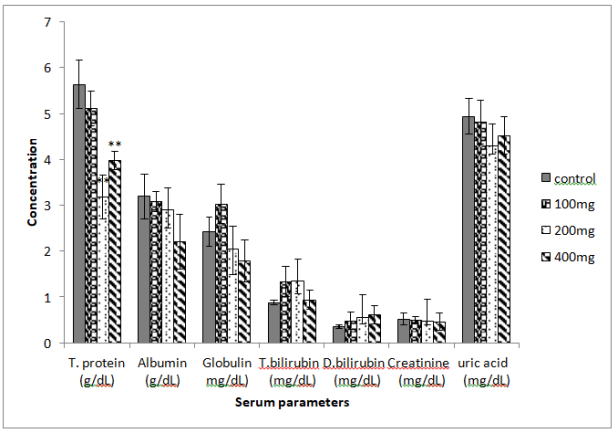


Figure 5: Effect of SXWP on biochemical parameters

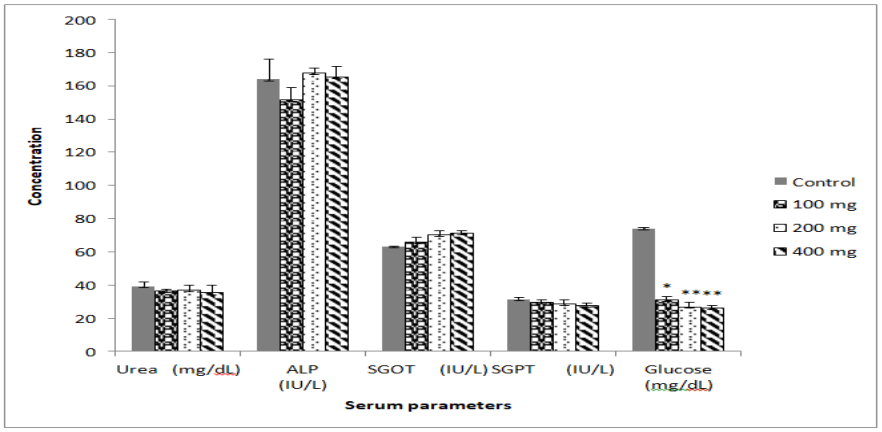


Figure 6: Effect of SXWP extract on liver enzymes, urea and glucose

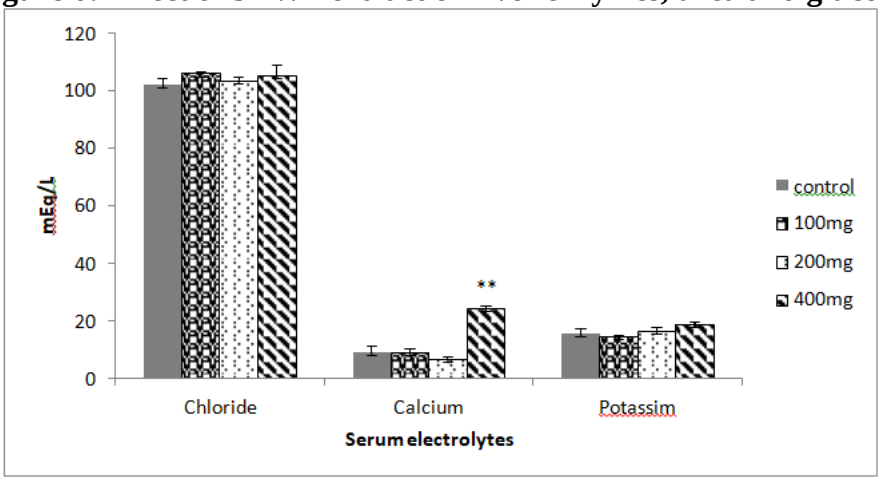


Figure 7: Effects of SXWP extract serum electrolyte

❖ **Lipid profile*:***

The lipid profile of SXWP extract treated groups and control group are shown in **table 9** and graphically depicted in **Fig 8**. In comparison to control group HDL level was highly significantly increased in group (III & IV). While the total cholesterol highly significantly decreases in III & IV group and LDL level was highly significantly decreased in group III and IV in comparison to control group. There were no significant changes in other lipid parameters.

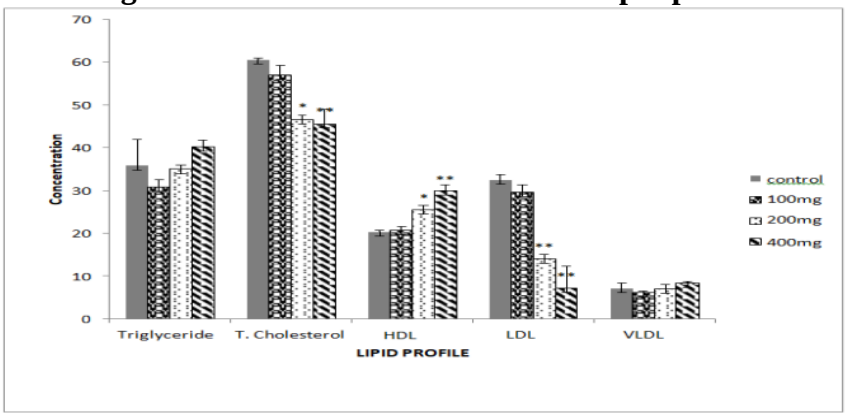
Table 9 Effects of SXWP extract on lipid parameters

Parameters	**Group I(control)**	**Group II(100mg)**	**Group III(200mg)**	**Group IV(400mg)**
Triglyceride (mg/dl)	35.83±6.080	30.85±1.618 ^{ns}	34.99±8.388 ^{ns}	40.21±1.513 ^{ns}
T. cholesterol (mg/dl)	60.491±0.408	56.96±2.30^{ns}	46.53±1.842**	45.56±3.33 **
HDL (mg/dl)	20.33±0.303	20.75±0.783^{ns}	25.56±1.38**	29.87±1.47**
LDL (mg/dl)	32.51±1.099	29.65±1.673 ^{ns}	14.01**±2.420 ^{ns}	7.25**±5.073
VLDL (mg/dl)	7.11±1.216	6.16±0.322^{ns}	6.97±1.675^{ns}	8.44±0.301^{ns}

*P < O.05 significant compared to control group

**p < 0.01 highly significant compared to control groupns = non-significant P> 0.05, compared to control group

Figure 8: Effect of SXWP extract on lipid profile



❖ **Hematological parameters results**

After 28 days administration of SXWP extract treated groups did not show any significant changes in hematological parameters like Hb, WBC, MCH, MCHC, MCV, Eosinophils, RBC, Monocytes as compaired to control group. While the Neutrophils and Platelets counts highly significantly increased in all treated groups as compare to control group and the Lymphocyte count increased highly significantly at 200mg/kg & 400mg/kg dose levels while at dose 100mg/kg changed no significantly as compared to control. **(Table 10 and graphical depicted in Fig. 9, 10, 11)**

Table 10: Effect of SXWP extract on blood parameters

Parameters	**Group I (control)**	**Group II (100mg)**	**Group III (200mg)**	**Group IV (400mg)**
Haemoglobin(mg/dL)	10.5 ±0.47	11.0±0.2 ^{ns}	10.6 ±0.78 ^{ns}	10.1 ±0.40 ^{ns}
WBC(10^3/mm^3)	8.70 ±0.6	8.02±0.3 ^{ns}	8.13 ±0.2 ^{ns}	7.4 ±0.13 ^{ns}
Neutrophils(10^3/mm^3)	2.28 ±0.08	2.58 ±0.11 **	2.83±0.10 **	2.86 ±0.07 **
Eosinophils(10^3/mm^3)	0.23 ±0.16	0.23 ±0.01 ^{ns}	0.20±0.02 ^{ns}	0.22±0.07 ^{ns}
Lymphocytes(10^3/mm^3)	7.20 ±0.07	7.9 ±0.16 ^{ns}	8.63 ±0.06 **	8.92±0.09 **
PCV (%)	32.08 ±1.3	36.32±0.73 ^{ns}	31.28 ±2.6 ^{ns}	30.83±1.2 ^{ns}
RBC(10^6/mm^3)	3.16± 0.05	3.9±0.08 ^{ns}	3.42 ±0.28 ^{ns}	3.4 ±0.14 ^{ns}
Platelets(10^3/mL)	188.6 ± 3.5	205± 6.12 **	212.9±5.12 **	239.6± 4.8 **
Monocytes(10^3/mm^3)	0.26±0.04	0.23±0.02 ^{ns}	0.21± 0.06 ^{ns}	0.24±0.03 ^{ns}
MCH(pg)	33.4±1.6	30.2±0.20 ^{ns}	31.4±1.39 ^{ns}	29.75±0.05 ^{ns}
MCHC(g/dl)	32.88±0.105	33.09 ±0.16 ^{ns}	34.23±1.60 ^{ns}	32.8±0.08 ^{ns}
MCV(fl)	101.68±4.63	97.79±2.88 ^{ns}	100.45±2.83 ^{ns}	99.48±4.7 ^{ns}

*P < O.05 significant compared to control group
** p<0.01 highly significant compared to control group
ns P> 0.05 ns = non-significant, compared to control group

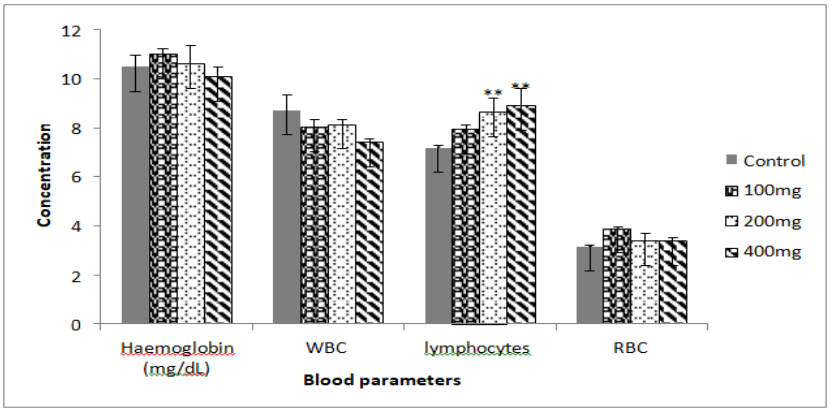


Figure 9: Effect of SXWP extract on blood parameters

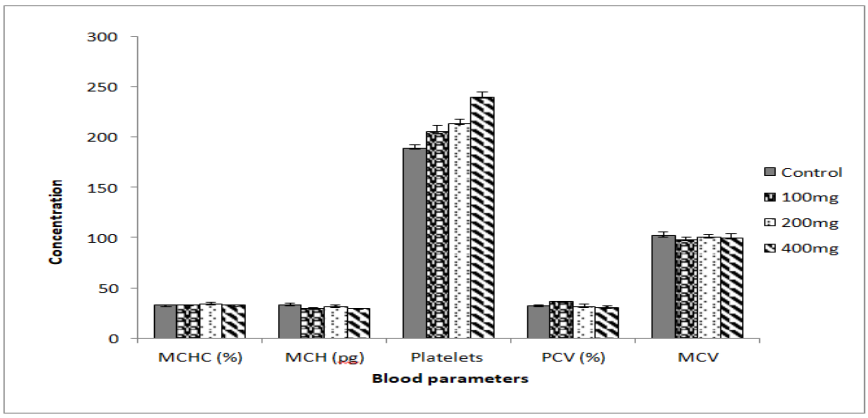


Figure 10: Effect of SXWP extract on MCHC, MCH, Plateletes, PCV and MCV

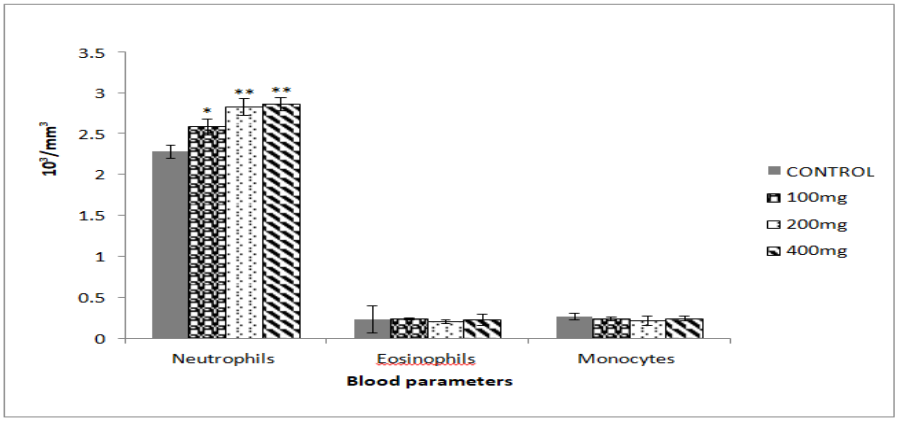


Figure 11: Effects of SXWP extract on Neutrophils, eosinophils and monocytes

Table 10: Effect of SXWP extract on relative organ wt

	Organ to body wt ratio mg/kg			
Organs	**Control**	**100mg**	**200mg**	**400mg**
Liver	4.32±0.87	4.30 ± 0.08^{ns}	4.31 ± 0.05^{ns}	4.11 ± 0.53^{ns}
kidney	0.38±0.03	0.40 ± 0.07^{ns}	0.36 ± 0.06^{ns}	0.39 ± 0.03^{ns}
Spleen	0.30±0.02	0.37 ± 0.06^{ns}	0.30 ± 0.08^{ns}	0.32 ± 0.03^{ns}

ns P> 0.05 non-significant compared to control group

❖ **Necropsy and Relative organ weight:**
After 28 days of extract administration extract did not produce macroscopic changes in organs compared to control group. There were none significantly differences between the control and dosed groups in the organ weights of the animals. Data are shown in **Table 11**, graphically depicted in **Fig. 12.**

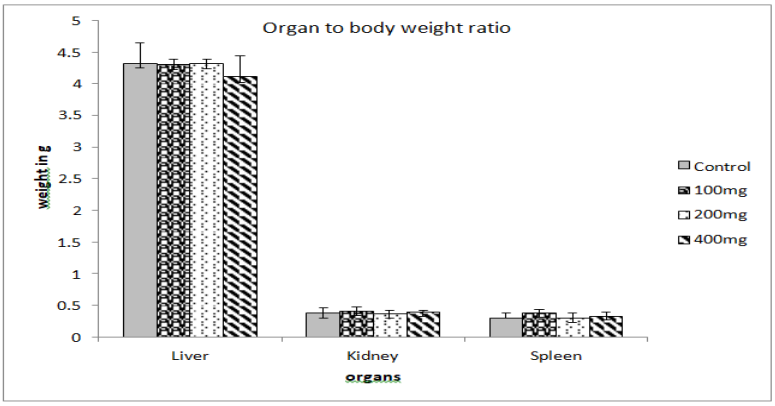


Figure 12: Effect of SXWP extract on relative organ weight

❖ **Histopathology**

➢ **Kidney**

It seems that the phytoconstituent presented in extract did not exhibit any apparent effect on the renal tissues. Histology of kidney of extract treated groups were similar to that of control group. Interstitial tissue presented between the tubular part did not show inconsistency, glomerulus inflamed only in some boumans capsules, tubular dilatation varying from narrow to wide as if the nephron flushing of the phytochemicals, medullary part showed distinct pyramid without any effect.

➢ **Liver**

Histopathology of liver of treated with SXWP extract is almost similar to that of control section. Centro lobular vein was normal, hepatic cord, sinosoides, lymphatic duct and bile capillaries did not show any abnormality. Glissons capsule was intact only at a few places some spaces and rupture of central lobular vein was observed without any other changes, where the internal walls of lobular vein are observed ruptured.

➢ **Spleen**

Histopathology of spleen of groups treated with SXWP extract was almost similar to that of control section In a normal section of spleen trabiculae were visible, stromal cells were distributed normally, thin walled veins were surrounded by red pulp containing lymphocytes and RBCs around arteries the tissue was condensed with large number of lymphocytes and fine branches of interespered trabiculli were visible.

4. Conclusion

The present study was aimed to assess the acute and subacute toxicity studies of hydroalcoholic extract of *solanum xanthocarpum* whole plant.

Results concluded that SXWP extract produce beneficial effect on some blood parameters upon oral administration. Biochemical parameter such as total protein content was changed which may not be beneficial but lowering of lipid profile can be beneficial for long term use. There were non significant change in the other serum parameters may proved its long term use, the kidney parameters too remain unchanged. Further studies are needed to verify the effect of low, medium and high dose for chronic administration of SXWP extract.

The present study proved that *Solanum xanthocapum* can be used for long term therapy in disease such as asthma and diabetes. The active constituents may be isolated further

for formulation development and clinical studies in future.

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