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# ACUTE TOXICITY STUDY OF ETHANOLIC EXTRACT OF *SOLANUM LYCOPERSICUM* (LEAF) IN SWISS ALBINO MICE

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**ABSTRACT:** The Present Study was planned to assess the acute toxicity of *Solanum lycopersicum* Leaf. The study was designed according to the OECD guidelines as per that the dose level used as 5, 50, 300, 2000, 4000 mg/kg. Mice were orally administrated single dose of 200 and 400 mg/kg of ethanolic extract of *Solanum lycopersicum*. Physical, Biochemical, Hematological as well as histopathological parameters were unaltered throughout the study. Mortality, signs of toxicity, bodyweight, food consumption and gross findings were observed for 14 days post treatment of *Solanum lycopersicum* extract. In addition, no significant differences were noticed in the body and organ weights between the control and treated groups. These results state that aqueous extract of *Solanum lycopersicum* is toxicologically safe by oral administration.

**INTRODUCTION:** Medicinal plants have occupied a vital place in the sociocultural, development of rural people of India [1]. *Solanum lycopersicum* is a plant in the family Solanaceae known as in India "Tamator" grown in China, India, United States, Turkey, Egypt, Iran, Italy, Brazil, Spain and Uzbekistan. Tomato (*Solanum lycopersicum*) is the second most produced and consumed vegetable in the world. It has been indicated in the prevention and treatment of cancer, asthma and atherosclerosis. Blood constituents labeled with radionuclides have been used in procedures in nuclear medicine. According to its functions, the fruit of *Solanum lycopersicum* has been extensively used in traditional medicine to cure human diseases including cancer diseases such as lung, prostate, stomach, cervical, breast, oral, colorectal, esophageal, pancreatic, and many other types of cancer, high blood pressure, treat edema, kidney and liver problems, and antioxidant cathartic.

The leaf contains alkaloid, flavonoid, steroid, carbohydrate, glycoside and rich source of Vitamin C [2]. The different parts of *Solanum lycopersicum* plant (seed, fruit, leaf, and stem) are used for medicinal purpose [3]. Recent studies showed that *Solanum lycopersicum* leaf extract has been found to have potential anti inflammatory [4], anthelmintic activity protection against parasitic intestinal worms [5], *Solanum lycopersicum* fruit extract shows anticancer activity [6], biological activity and isolation of genes [7].

Toxicity is the fundamental science of poison. The organisation for Economic and development (OECD) mentioned acute toxicity as the advance effect occuring within a short time of oral administration of a single dose of a substance or a multiple dose given within 24 hrs. Phytochemical interactions of poison lead to injury or death of

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living tissues. Toxicology is like science and an art like medicine. It includes observational data gathering and data utilization to predict outcome of exposure in human and animals. The ancient humans categorised some plants as harmful and some as safe [8].

Acute and chronic toxicology of unripe fruit of the *Solanum lycopersicum* has been documented. However, toxicology study of the *Solanum lycopersicum* leaf extract (EESL) has not been carried out. Therefore, the present study is to investigate the acute toxicity of the *Solanum lycopersicum* leaf extract on Swiss Albino mice.

## MATERIALS AND METHODS:

### Test article and extraction

Fresh leaves of *Solanum lycopersicum* Linn. were collected from the surrounding of Lucknow, Uttar pradesh, India, in the month of November 2012, and authenticated by Dr. Tariq Hussain, Senior principal scientist of plant divercity, systematics and herbarium division NBRI, Lucknow and U.P, India.

A voucher specimen has been deposited in the Department of Botany NBRI, Lucknow. The leaves were shade dried at room temperature ($25^0$C) for 10 days, and finely grounded into powdered form with the help of an electric grinder and stored. The powdered material was extracted in ethanol via maceration process for approximately 7 days. The solvent was removed by distillation under reduced pressor.

The residue was shade dried until further use. The yield of prepared extract was 87.77%. Primary phytochemical investigation was conducted by the methods of Kokate.

### Animals

Adult female Swiss albino mice were used for acute toxicity, weighing 25- 30gm (age 4-6 weeks) were housed in stainless-steel wire cages in a well-ventilated room at temperature $22^0$ C (± 3°C), humidity 56 ± 5% and under 12-h light/dark cycle. Each cage contained 5 to 6 mice of the same sex with a bedding of husk. Food and tap water were given *ad libitum.* All animal experiments were carried out as per CPCSEA guidelines (Approval No. -1397/ac/10CPCSEA).

### Acute Toxicity Study and Dose Selection

Acute oral toxicity test was performed as per [9] guidelines. The overnight fasted mice were randomly distributed into one control group and treated groups, containing three animals per group. The control group received vehicle alone. Treated groups were orally administered 2000 mg/kg body weight ethanolic extract following the method of [10]. After administration of the extract, the animals were observed continuously for the first 2 hours and 24 hrs to detect changes and 14 days for any signs of behavioral changes, salivation, diarrhoea, lethargy, sleep, toxicity, mortality and body weight.

### Statistical analysis:

The result were express as Mean ± SEM. Statistical analysis was carried out using student-t test. $P<0.05$, $P<0.01$ and $P<0.001$ were considered statistically significant.

## RESULTS:

In the acute toxicity study we observed that group treated who were administered ethanolic leaf extract of *Solanum lycopersicum* up to 2000 mg/kg body weight showed a highly significant increase ($P<0.05$) in body weight when compared to control group as shown in **Fig. 1**.

The percentage increase in body weight of treatment mice measured weekly on day 7 and 14 were found 77.8%. The amount of food and water consumed was measured daily from the quantity of food and water supplied and the amount remaining after 24 h. Food and water consumption **(Table 1)** was found to be normal throughout the dosing period of 14 days when compared the treatment groups with control.

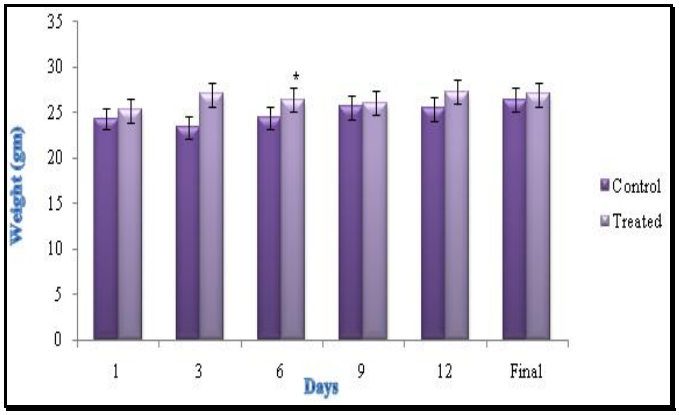



**FIGURE 1: GRAPHICAL REPRESENTATION OF BODY WEIGHT OF MICE DURING 15 DAYS, *P<0.05**

**TABLE 1: CHANGES IN FOOD AD-LIBITUM OF FEMALE ALBINO MICE TREATED WITH EESL FOR FIFTEEN DAYS**

| Groups | Amount of food intake(gm) | | | Amount of water intake(ml) | | |
|---|---|---|---|---|---|---|
| | Initial | Middle | Final | Initial | Middle | Final |
| Group A (control) | 3.16 | 6.1 | 6.8 | 3 | 3.3 | 2.9 |
| Group B (treated) | 4.2 | 8.2 | 9.3 | 3.6 | 3.7 | 3.7 |

In haematology, Hematological parameters of female mice were examined as shown in **Table 1**. The granulocyte and mean carpuscular haemoglobin (MCH) were significantly higher ($P<0.05$, $P<0.001$) than that in the control group. While RBC was significantly lower ($P<0.01$) than that in the control group **(Fig. 2).**

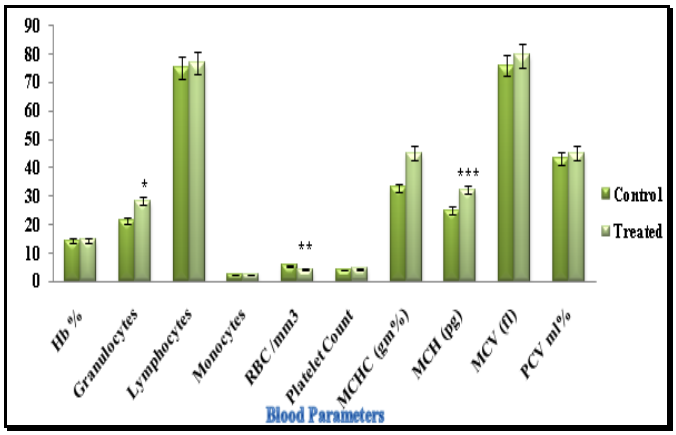



**FIGURE 2: HAEMATOLOGICAL PARAMETER AFTER 15 DAYS OF ACUTE TOXICITY STUDY. *P<0.05, **P<0.01, ***P<0.001**

Female mice fed with the extract at a dose of 2,000 entire period of 14 days of observation. In histopathology no abnormalities were detected in pathological examinations during microscopic examination of internal organs as comparaed to control and test animals. Six organs of all animal (brain, lungs, heart, kidney, spleen, and liver **(Fig. 3)** were examined [13]. All vital organs were in normal level.

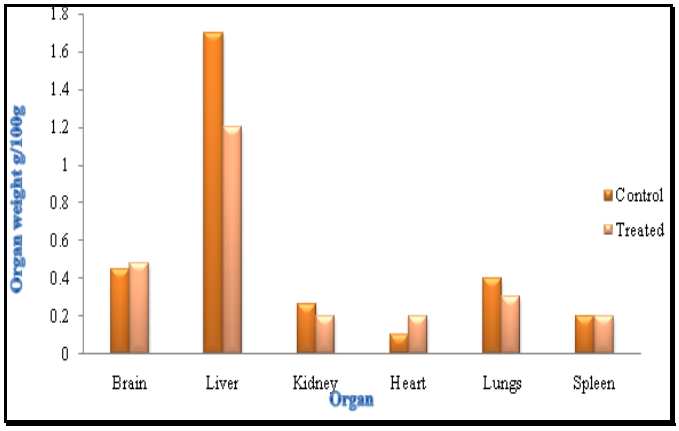
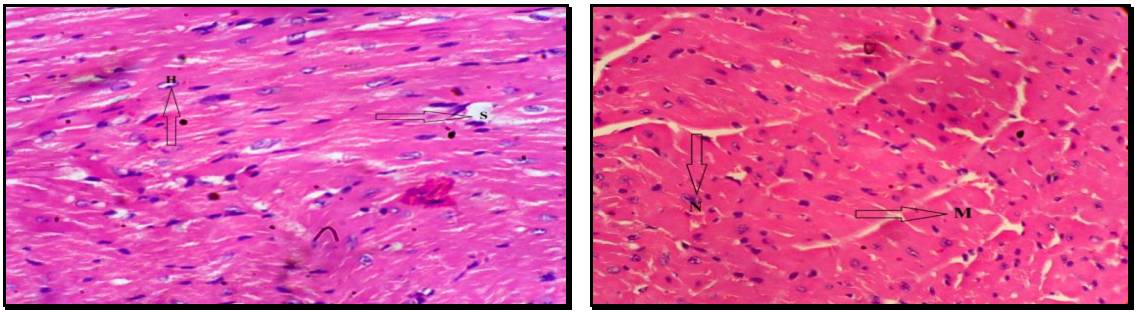
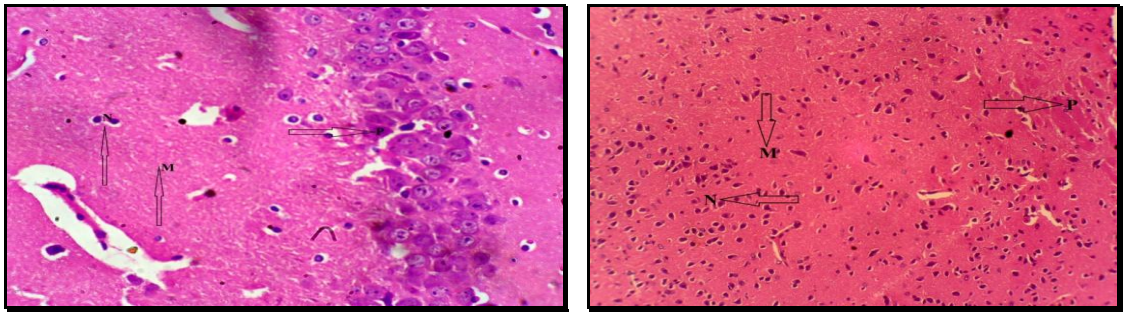



**FIGURE 3: GRAPHICAL REPRESENTATION OF HISTOPATHOLOGY OF FEMALE MICE AFTER ACUTE TOXICITY STUDY**

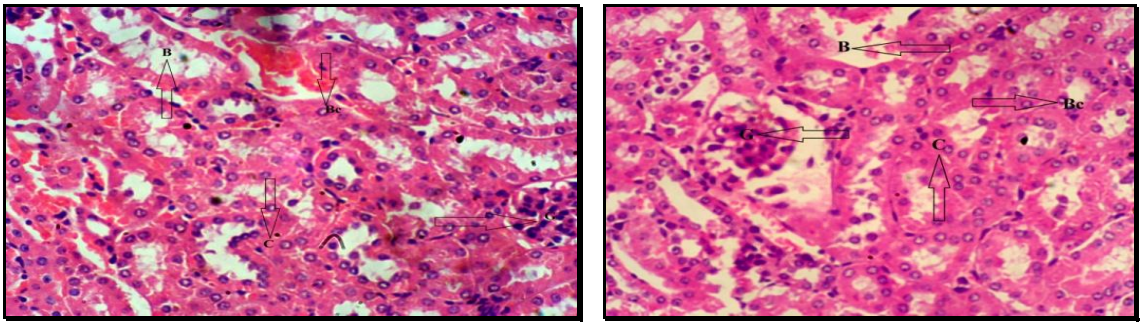
**CONTROL** **TREATED**



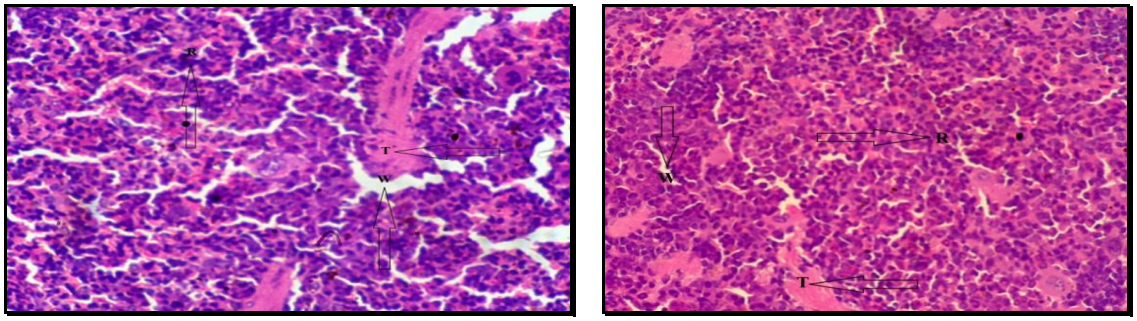

**HEART: SHOWN A NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (M- MYOCARDIUM, N- NUCLEI OF MYOCYTES)**



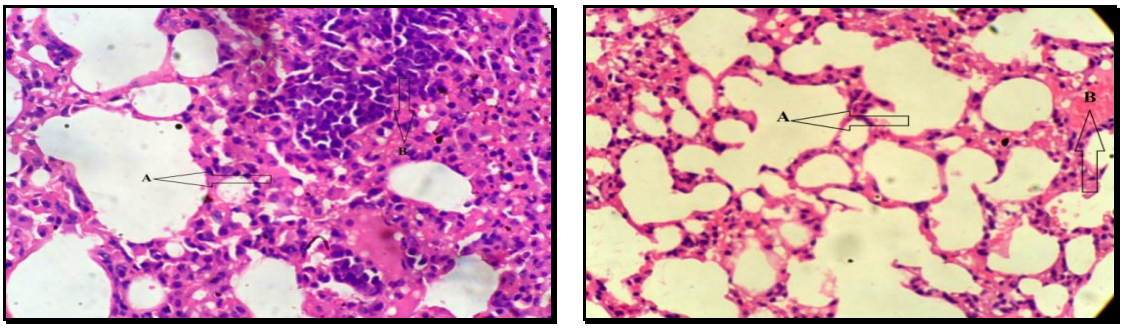

**BRAIN: SHOWS NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (N- NEURON, P- PURKINJE CELLS LAYER, M- MOLECULAR LAYER)**



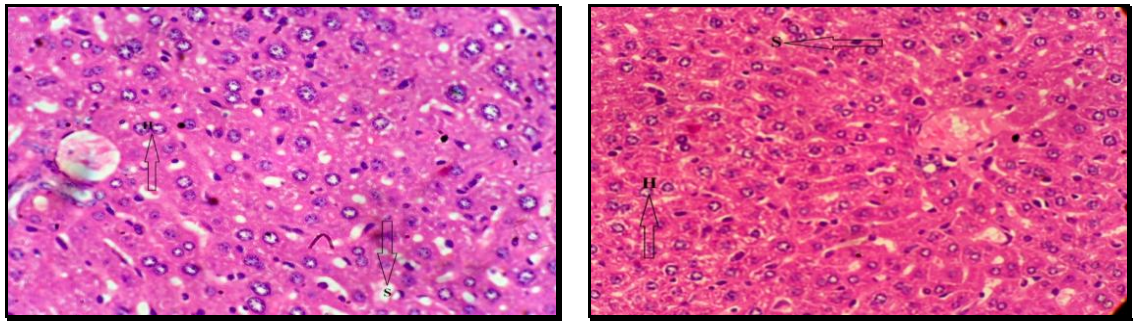

**KIDNEY: SHOWS NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (G- GLOMERULI, B- BOWMAN'S SPACE, C- CAPILLARIES, BC- BOWMAN'S CAPSULE)**




**SPLEEN: SHOWS NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (R- RED PULP, T- TRABECULA, W- WHITE PULP)**




**LUNGS: SHOWS A NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (A- ALVEOLI, B- BRONCHIOLE)**




**LIVER: SHOWS A NORMAL HISTOLOGICAL ANATOMY AS COMPARED TO CONTROL (S- SINUSOID, H- HEPATOSIDE)**

**FIGURE 4: HISTOPATHOLOGICAL ANALYSIS OF EESL (LIVER, SPLEEN, KIDNEY, BRAIN, LUNG, AND HEART) OF CONTROL AND TREATED MICE.**

**DISCUSSIONS:** Analysis of variance (ANOVA) revealed significant differences in the acute toxicity study of tomatoes. There is growing concern about the toxicity of herbal remedies as they contain substantial amounts of pharmaceutically active ingredients whose mechanisms of actions and adverse effects are mostly unknown [14]. Severe injury, including acute and chronic abnormalities have been described after the ingestion of a wide range of herbal products such as mushrooms, germander (*Teucrium chamaedrys*), chaparral (*Larrea tridentate*) etc [15]. Hence, investigations on

haematological and histopathological alterations associated with acute oral toxicity of ethanolic extract of *Solanum lycopersicum* leaf were conducted. In acute toxicity study, there was no mortality up to a maximum dose of 2000 mg/kg body weight of EESL after per oral administration.

The changes in body weight have been used as an indicator of fat accumulation in the body [16]. Since no changes were observed in animal behavior, body weight and organ weight at all dose levels in treated mice as compared to control group, so it can be say that EESL is nontoxic at the doses administered.

Acute toxicity study also showed no significant changes in haematological parameter. There is trancient increase in MCH (mean cell volume), MCHC (mean corpuscular haemoglobin concentration), and reduction in red blood cells (RBC) showed anaemic condition due to iron deficiency or may be Vitamin deficiency [18] or may be suppression of circulating hormones [19].

However an increase in the parameter granulocytes due to some allergic reaction or infection [20]. The EESL did not show any toxic effect on the internal organs of the mice in histopathology. All vital organs (brain, liver, lungs, spleen, heart, and kidney) were in their normal sizes. Lungs showed thickening of wall due to weight gain of treated mice during 14 days of period of toxicity study as compared to control mice. These results indicate no toxicity effect of the substance due to no changes in such parameters, which are often the first signs of toxicity [21].

**CONCLUSIONS:** Based on these result, no toxic effect was observed up to 2000 mg/kg of *EESL* treated via oral route over a period of 14 days. The results of present study have shown that acute administration of ethanolic extract of *Solanum lycopersicum* leaf may be safe as the LD50 could not be determined at the doses given. This study is not a complete toxicity study. It emphasizes the call for carrying out toxicity studies even in natural plant products.

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