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Acute Oral Toxicity Study of Aqueous Leaf Extract of Celosia Argentea in Female Albino Rats

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ABSTRACT

Celosia argentea is a plant of family Amaranthaceae used as traditional medicine for various diseases. The aim of the study is to evaluate the acute toxicity effect of Celosia argentea leaf extract for 14 days in female albino rats. The aqueous extract of Celosia argentea showed no evidence of single dose toxicity (2000 mg/kg) when studying acute toxicity on biochemical, hematological or histological parameters. The results showed that .C. argentea does not cause toxicity at the doses studied.

KEYWORDS: *Amaranthaceae, leucorrhoea, atherosclerosis, abortifacient, Alanine aminotransferase (ALT) and aspartate aminotransferase*

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INTRODUCTION

Traditional and alternative medicine is extensively used in the prevention, diagnosis and treatment for various illnesses. The usage plant products types of medicines were used for past 20 years which is easily accessible in some regions (1). Plant derived foods like leaf, vegetables, fruits, etc., are considered to be highly beneficial components in human diet. They contribute great importance in daily life by providing wide range of nutrients, vitamins and other components which widen the therapeutic arsenals. In general, natural products play an important role in the development of novel drugs leads for the treatment and prevention of diseases (2).

Celosia argentea is an herbaceous plant and belongs to Amaranthaceae family that grows in a terrestrial habitat. It is an erect plant and grows to a height of 1.0 to1.6 m under favorable condition Plant show simple and spirally arranged leaves, flowers are often pinkish or white colour, fruits are in globular shape and seeds are black. The C. argentea has great medicinal value, used in the treatment of fatigue, leucorrhoea, atherosclerosis and osteoporosis (3). The *C. argentea* is used as distinguished leafy vegetable, skin whitening agent as well as medicinal plant for diarrhea, bleeding piles, gastrointestinal diseases, jaundice, sores, ulcers, snakebite and as an abortifacient(4). The anti-inflammatory, antispasmodic, anti-analgesic and can be attributed to their high steroids, tannins, terpenoids and saponins. Pharmaceutical preparations derived from natural sources such as fruits, vegetables or any plant materials often contain compounds that contribute to the antioxidant defense systems and apparently play a role in the protection against degenerative diseases. Since the phytochemicals cure diseases without causing any harm to human beings these can also be depicted as ecofriendly and man friendly medicines.(5).

Toxicity is an expression of being poisonous, indicating the state of adverse effects led by the interaction between toxicants and cells. The interaction may vary depending on the chemical properties of the toxicants and the cell membrane, as it may occur on the cell surface, within the cell body, or in the tissue beneath as well as at the extra cellular matrix. The toxic effects may takes place prior to the binding of the toxicants to the vital organs such as liver and kidneys. Hence evaluation of the toxic properties of the substance is crucial when considering for public health protection because exposure to chemicals can be hazardous and lead to adverse effect on human beings. In practice, the evaluation typically includes acute, sub-chronic, carcinogenic and reproductive effects (6). The aim of the study is to evaluate the acute toxicity study of aqueous leaf extract of celosia argentea in animal models was carried out on female albino wistar rats under OECD Guidelines(7).

MATERIALS AND METHODS

PREPARATION OF PLANT EXTRACTS

Collected leaves of *Celosia argentea* were air-dried under shade at room temperature and then crushed into coarse powder. This powder was extracted with water by soxhlet and filtered using Whatman No.1 filter paper and the solvent was removed by evaporator. On removal of the solvent, a brownish black colour residue was obtained.

EXPERIMENTAL ANIMALS

Swiss albino wistar rats were used. They were housed in groups in polypropylene cages and kept under standard environmental conditions. They were given pelleted food and drinking water *ad libitum*. The rats were acclimatized to the laboratory conditions for at least five days prior to commencement of the experiments. The institutional animal ethics committee approved the experimental protocol. (Reg. No.

EXPERIMENTAL DESIGN FOR ACUTE ORAL TOXICITY

The acute oral toxicity was conducted under the guidance of OECD Guideline for the Testing of Chemicals No. 423 [7]. To achieve this test, ten female rats weighing 150-200 g were randomly divided into two groups offive rats each. Rats in the control group received distilled water. The dose of *Ca*AE used as the starting dose was 2,000 mg/kg body weight. Prior to the treatment, food but not water was withheld for 3 hours. *Ca*AE dissolved in distilled water was administered in a single dose of 2,000 mg/kg by gavage in a volume of 1 ml/100 g body weight, using a suitable intubation cannula to a group five rats (test group). Following the treatment, animals were fasted for 2 hours and then observed.

Animals were observed for general behavior changes continuously for 30 minutes, every hour during the first 24 hours and at least once daily for 14 days after administration of the extract. Observations were focused on parameters such as piloerection, sensitivity to sound and touch, locomotion, aggressiveness, and appearance of feces. The number of survivors was noted after 24 hours. Animals were weighed on day 0, and then on days 7 and 14. At the end of the study, all surviving animals were sacrificed and some internal organs such as liver and kidneys were removed and weighed. A gross pathological examination of these organs was also performed.

SAMPLE COLLECTION

During the experimental period, body weight, food, and water intakes were recorded once a week. Before the sacrifice, blood from each animal was collected in the retro-orbital sinus into ethylene diamine tetraacetic acid (EDTA) tubes for hematological analysis and into dry tubes for the assessment of biochemical markers. Animals were then sacrificed by decapitation and the organs were removed for histopathological studies.

BIOCHEMICAL ANALYSIS

Blood collected in dry tubes was allowed for complete clotting and then centrifuged at 3,500 rpm at 4°C for 15 minutes. The serum was collected and stored at −20°C until analyzed. The serum was assayed for total proteins by the Biuret method (8). Urea were analysed by GLDH/UREASE method, Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were analyzed according to the method of Reitman and Frankel (9) using commercial kits (BIOCLIN, Brazil). Total cholesterol and high-density lipoprotein (HDL) were evaluated using a colorimetric method by commercial kits (INMESCO, Germany). Creatinine was analyzed using a kinetic method (10).

HISTOPATHOLOGICAL STUDY

The liver and the kidneys were removed and fixed in 10% neutral buffered formalin. The organs were embedded in paraffin blocks followed by sectioning (sections of 5 µm) and staining with hematoxylin and eosin. Preparations were examined under electronic microscope and observed for any changes when compared to normal groups.

Statistical Analysis: The statistical analyses were carried out using statistical package for social sciences (SPSS- computer package). Percentage organ-body weight ratios and rats' body weights were expressed as mean ± SD. Values in all groups were compared using the analysis of variance (ANOVA). For all analyses the level of statistical significance was fixed at $p<0.05$ (11).

RESULTS AND DISCUSSIONS

Oral administration of *Ca*AE at the single dose of 2,000 mg/kg was followed by no significant abnormal change in behavioral properties of rats during 14 days of observation and no mortality. In addition, the body weight and the weight of organs were statistically similar in both control and test groups (Table 1). All internal organs examined at necropsy were free from any gross pathological changes. Regarding these results, the LD50 of *Ca*AE exceeds 2,000 mg/kg and according to the GHS for the classification of chemicals, *Ca*AE belongs to category five, the category of relatively non-toxic substances.

Table 1 Body weight and relative weight of vital organs of rats after administration of a unique dose of 2,000 mg/kg of *Ca*AE

GROUPS	Initial body weight	Final body weight	Liver	Kidney
CONTROL GROUP	155±9.7	161±5.3	4.52±0.52	1.09±0.03
TEST GROUP	166±5.1	172±4.2	4.82±0.45	1.42±0.05

Effect of *Ca*AE on biochemical parameters of Rats

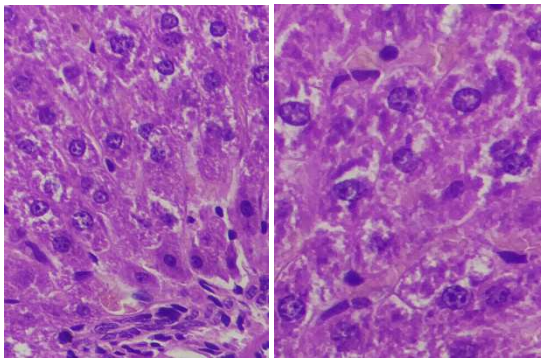
*Ca*AE caused no significant changes in blood glucose, urea, plasma creatinine, total proteins, total bilirubin and cholesterol whilst there was a limited increase in the activities of liver marker enzymes ALT and AST in test group animals were shown in Table 2.

Table 2 Biochemical parameters of rats after administration of *Ca*AE for 14 consecutive days

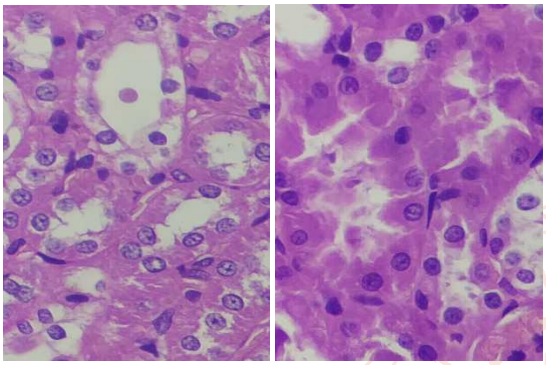
Prameters	Control Group	Test group Treated with 2000mg/kg
Glucose(mg/dl)	105±10.53	95±5.27
Protein(g/dl)	7.41±1.01	6.82±2.32
urea(mg/dl)	29±1.01	30±2.09
creatinine(mg/dl)	1.1±0.4	0.9±0.1
Toatal Bilurubin(mg/dl)	1.0±0.01	1.1±0.1
ALT(IU/L)	61±4.42	70±4.68
AST(IU/L)	84±5.2	93.8±7.22
HDL(mg/dl)	72±2.1	78.11±9.6

HISTOPATHOLOGICAL STUDIES

Histopathological analysis has shown tissues from liver and kidney of the treated groups to be morphologically similar to the control groups.



A. Normal Liver B. Treated Liver



C. Normal Kidney D. Treated Kidney

DISCUSSION

Medicinal plants are widely used for various diseases because of its less or non toxic effects (12). Changes in body weight and relative weight vital organs are indicators of the effect of an administered substance (13). No mortality and signs of toxicity were observed after administration of the dose limit (2000 mg/kg). This shows that the lethal dose is above this dose limit. The acute lethal effect of *Ca*AE on rats shows that no animal died within 24 hours after treatment with extract. So, there is not much change in body weight (Table 1) of treated group when compared to normal group.

For biochemical parameters (Table 2), no significant variations in most of the parameters were noted. Although ALT and AST are common liver enzymes because of their high concentration in hepatocytes, only ALT is specifically remarkable for liver functions since AST is mostly present in myocardium, Skeletal muscle, brain and kidneys (14). A histopathological examination of the liver and kidneys show no significance except oedema and inflammatory infilterations.

CONCLUSION

From the result of the studies, it can be concluded that the acute (14 days) oral administrations of *Ca*AE did not produce any clinical signs of toxicity or mortality in the female mice. Histological examination showed no change in the architecture of the internal organs of the heart, liver and kidneys, in both control and treated groups. However, complementary studies are necessary in order to enter information on this plant.

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