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Research Paper

Biochemical Screening of The Effect of a Plant Extract on Albino Mice Physiology

Biology

KEYWORDS : medicinal, active constituents, toxicity, nervous system, liver.

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ABSTRACT

A plant shows medicinal or toxic property depending upon its active constituents. It is easily acceptable that a plant may show both the property in different combination or concentration. Here in this study a plant having medicinal use has taken for screening its toxicity. It has been found that the plant showed marked toxicity against the nervous system and liver of albino mice. The elevation in the entire three enzyme ie. Brain LPO, SGOT and SGPT by the seed extract of Thevetia peruviana has cleared the fact that the extract affects the physiology of the animal.

Introduction:

Plants are the resource of thousands of compounds which are the principle materials of natural product laboratory. Natural products became very effective and safe option for therapeutic purpose from the earliest age of human civilization. In view of this fact pharmacology has an enormous role to screen the raw materials that can be achieved from nature. Otherwise it may be just a difference of dose which will determinate that the product is medicine or toxin. Besides in many cases a mixture of multiple compounds also used to overcome the toxicity of necessary one. The plant considered here is Thevetia peruviana. It is an ever green ornamental dicotyledonous shrub that belongs to Apocyanaceae family (Dutta, 1964). Its different parts can be used for the treatment of various disorders in human being such as diabetes, liver toxicity, fungal infection, microbial infection, inflammation, pyrexia and to relieve pain (Singh et al., 2012). Zibbu & Batra (2011) reported that different parts of the plant also used in toothache, fevers. They also find that it is used in anti rheumatic, decongestant. Its branches has used for febrifuge and purge (Thilagavathi, 2010). Thevetia peruviana has inhibitory effect against HIV-1 reverse transcriptase and HIV-1 integrase (Tewtrakul et al., 2002). The seed oil is applied externally in India to treat skin infections (Engl. & prantl, 1895). The seed contains 60-65% oil and the cake comprise of 30-37% protein (Usman et al., 2009). Despite the fact that there is high level of oil and protein in the seed it remains non edible because of presence of cardiac glycoside (toxin). Enriquez et al., (2002) found that T. peruviana created acute toxicity in Rodents. Here in this study the plant material has collected from the forest of Cachar district of Assam of north-east India. This area consists of small hillocks, plains, beels and extreme low-lying flood prone areas. The mean maximum temperature of this area was 37^{0}C in summer and mean minimum temperature was 100C during winter months (Sharma et al., 2002). The rainy season starts from April to September, while the months of December and January exhibit very dry period in this area. The valley and low hilly sides have clay loam to sandy loam type of soils. Physiography and climate of an area has a very important role in the diversity and characteristics of the flora and fauna of a particular site and are directly related to environmental factors. Present study conducted to evaluate the toxic effect of the seed of the plant against albino mice regarding biochemical changes in brain and serum. Brain enzyme assay was considered as the it controls entire physiological system of animal body and serum parameters was also measured to document the condition of liver because liver is the detoxifying organ of animal body.

Materials & METHODS:

The fresh plant material (seed) of the plant Thevetia peruviana was collected. The plant was identified by "Assam University Herbarium collection centre". The seeds were shadow dried and grinded for extraction. Than the grind material was dipped in distilled water and the extract was prepared in desired concentration (Akindele & Adeyemi, 2010).

The experimental model was Swiss albino mice (25-30g) and it was provided by Pasteur institute, Shillong. The acclimatization of mice was done by the rules and guidelines of "Assam University Animal Ethics Committee". Than the experimental groups (6 in each group) of mice were constructed as control group (treated with distilled water orally), low dose group (treated with 50mg/kg extract orally) and high dose group (100 mg/kg extract orally) for seven days. Then the brain lipid peroxidation (LPO), serum glutamic- oxaloacetic transaminase (SGOT) and serum glutamic- pyruvic transaminase (SGPT) assays were performed by the procedure given below.

On the seventh day mice were sacrificed by decapitation and blood samples were collected in heparinized tubes to avoid coagulation (Hazmi et al., 2004). A portion of both cerebral cortex and midbrain of brain were separated and washed with saline for biochemical assay. Than the tissue were homogenized in 0.15 M KCl for LPO assay by the method of Wilbur et al., (1949). Protein was also measured by Lowry et al., (1951) for calculating specific activity of the brain tissue enzyme. After this serum parameters GOT & GPT were estimated by Reitman and Frankel (1957) method in previously collected blood. One way ANOVA was done by using SPSS software along with Students- Newman Keuls, Turkeys multiple comparison test for comparing the data.

Results & Discission;

The LPO activity showed significant elevation in cerebral cortex when exposed to the plant extract in both the concentrations. But in case of midbrain only high dose was found significant (Fig 1). Similar result was found by Subhashini et al., (2011). They reported that LPO increased in myocardial homogenate of Isoproterenol administered rats indicating oxidative stress. Shivarajashankara et al., (2001) also found increased LPO in rat's brain due to fluoride intoxication. Nascimento et al, (2005) also found elevated LPO than control when exposed to Pilocarpine (induced seizure). Wide range of compounds creates toxicity by over production of reactive oxygen species and elevation of lipid peroxidation (Haliwell & Gutteridge, 1986). Here the plant extract creates the oxidative stress in mice brain by increasing the lipid peroxidation level.

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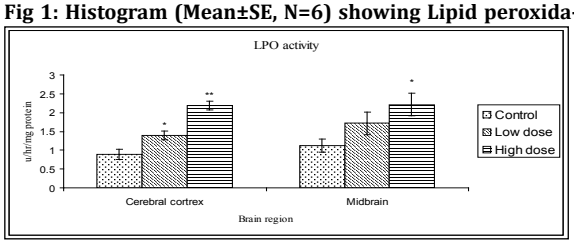
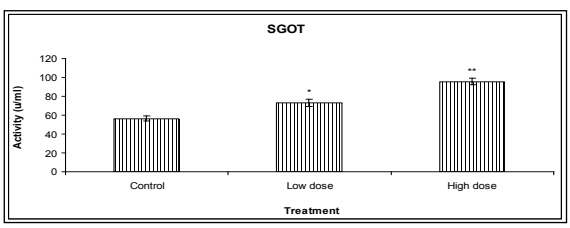
Fig 1: Histogram (Mean±SE, N=6) showing Lipid peroxidation effect. Here one way ANOVA, SNK-Turkey post hoc test used to analysis the data. (*P< 0.05 & **P< 0.01 vs Control)



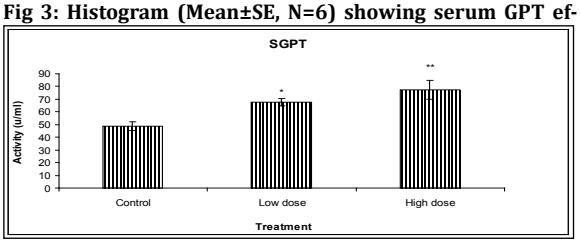
The SGOT in serum activity showed significant elevation when exposed to both the concentrations of T. peruviana (Fig 2). Hazmi et al., (2004) found increased GOT in serum when exposed to toxic effects of Nutmeg seed.

Fig 2: Histogram (Mean±SE, N=6) showing serum GOT effect. Here one way ANOVA, SNK-Turkey post hoc test used to analysis the data. (*P<0.05 & **P<0.01 vs Control)



The GPT in serum activity showed significant elevation when exposed to both the concentration of T. peruviana (Fig 3). Hazmi et al., (2004) also found increased GPT in serum when exposed to toxic effects of Nutmeg seed. Yasmin et al., (2011) reported that sub chronic toxicity of Arsenic trioxide increased the SGOT & SGPT level in albino mice. Lead acetate induced toxicities had increased the SGOT and SGPT level in mice according to Khan et al., (2008). GOT and GPT are the enzymes that are directly related to liver. An increase of these enzymes indicates the liver damage which prevents normal liver function. It is also preliminary symptom of liver cancer. Liver is the organ which involves in detoxification of animal body. So once liver got affected it is very difficult for the physiological system to get rid of any toxicity. Besides liver is directly connected with brain. So it showed secondary effect in brain also.

Fig 3: Histogram (Mean±SE, N=6) showing serum GPT effect. Here one way ANOVA, SNK-Turkey post hoc test used to analysis the data. (*P<0.05 & **P<0.01 vs Control)



CONCLUSION:

Just showing a similarity with previously cited reports T. peruviana depicts a vivid picture of toxicity in mice. Though it has used in traditional practice as well as in modern science. Here we found severe oxidative stress in brain which increases the lipid peroxidation level in the tissues of cerebral cortex and mid brain. It was supported by the blood parameters. The glutamic-oxaloacetic transaminase and glutamic- pyruvic transaminase showed elevation. So we can conclude that hepatic damage has occurred along with neurological deficits. As the plant has medicinal importance so it is essential to evaluate all the possible toxic properties like neurological and hepatic infection. It is strongly recommended to perform detail pharmacological screening before using this plant in any purpose.

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