

Some of the Regenerative Properties of the Aqueous Extract of *Ocimum sanctum* on the Cytoarchitecture of the Liver of Adult Female Wistar Rats Following Paracetamol Induced Liver Damage

¹S.B. Mesole, ¹Y.G. Mohammed, ¹C. Nyaribo, ¹J. Olusakin and ²A.O. Okpanachi

¹Department of Human Anatomy,

²Department of Human Physiology, Kampala International University, Western Campus, Ishaka, Bushenyi, Uganda

Abstract: The aim of the present study is to investigate some of the regenerative properties of *Ocimum sanctum* on the cytoarchitecture of the liver of adult female wistar rats following paracetamol induced liver damage. There is a lack of good hepatoregenerative drugs in modern medicine to alleviate and treat drug-induced liver damage. Leaves of sacred holy basil, also called Green Tulsi (*Ocimum sanctum*), belonging to family Lamiaceae are used traditionally for their hepatoregenerative effect. We wanted to evaluate the hepatoregenerative activity of *Ocimum sanctum* on paracetamol induced liver damage among female adult wistar rats. At the end of this research which lasted for 14 days, remarkable and appreciable improvement was noticed in the appearance of the cytoarchitecture of the liver and reduction in sinusoidal congestion, cloudy swelling and fatty changes and regenerative areas of the liver were observed on histopathological examination in groups of the liver of group II and III that was administered variable dosage of the extract as compared to the group I which displayed only hepatic necrosis. We concluded from the result of our research that aqueous extract of *Ocimum sanctum* shows hepatoregenerative activity.

Keywords: Cytoarchitecture, hepatic necrosis, hepatoregenerative, liver damage, *Ocimum sanctum*, paracetamol

INTRODUCTION

The World Health Organization (WHO) has laid emphasis on promoting the use of traditional medicine for health care. World Health Organization (2008) hence, we see a focus on research on traditional and herbal medicine, especially in developing countries, with individual as well as collaborative efforts by National research organizations (Satyavati *et al.*, 1987).

There is an acute necessity of reliable hepatoregenerative drugs in modern medical practice. Traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health as well as to prevent, diagnose, improve or treat physical and mental illnesses. Herbal treatments are the most popular form of traditional medicine. Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products that contain parts of plants or other plant materials as active ingredients. WHO (2008) However, no scientific data regarding the identity and effectiveness of these herbal products were available, except in the treatise of Ayurveda and Unani medicine (Gupta, 1994).

This present research is aimed at investigating the hepatoregenerative property possessed by *Ocimum*

sanctum using an aqueous extract as opposed to alcoholic extract used by previous studies.

MATERIALS AND METHODS

Animals: Twenty four female adult wistar rats were used for this experiment. The animals weighed between 120-190 g. The animals were kept and housed in the animal holdings of the Department of Human Anatomy, Kampala International University, under standard laboratory conditions of temperature, light and humidity and were fed with rat pellets and water *ad libitum* during the entire period of this research in line with the recommendation of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) for laboratory animal facilities. CPCSEA (2003) the rats were randomly divided into four groups. This study was carried out at the department of Human Anatomy, Kampala International University Uganda. It was conducted in the month of February, 2012.

Plant collection and extract preparation: Plant samples were collected from the Botanical Garden of the department of botany Makerere University, Kampala Uganda. The sample was taken to the herbarium of the Department of Botany, Makerere University for identification.

One kilogram of fresh *Ocimum sanctum* leaves was washed thoroughly with running tap water, dried in the shade at room temperature and, thereafter, crushed in an electrical mixer-grinder. Hundred grams of this air-dried powder of the leaves was soaked in water and was allowed to stand for 24 h. The soaked powder was then transferred to a percolator, where it was firmly packed in and allowed to macerate for 24 h at room temperature, followed by slow percolation. The procedure was repeated over the next 24 h to yield 5 g of a dark greenish-black and sticky extract (5% dry weight of powdered leaves). The extract was refrigerated at 4°C till when used. The *Ocimum sanctum* suspension was used in doses of 200 mg/kg BW and 100 mg/kg BW.

Hepatotoxin used: Paracetamol (PCM) powder (I.P.) (obtained from the department of Pharmacology and toxicology of Kampala international university) was used to make the suspension in a dose of 2 g/kg BW for the respective group.

Extract administration: The animals were randomly grouped into 4 groups of eight animals each. Group I was administered 2 g/kg BW of PCM only, group II and III were administered 200 mg/Kg, 100 mg/Kg BW of OSE and PCM, while group IV was the control group which was administered with Phosphate Buffered Saline (PBS) only.

Animal sacrifice: The rats were sacrificed (on the 14th day) under deep ether anesthesia and the liver samples were excised and washed with normal saline. Then, the livers were fixed immediately in 10% formalin. A paraffin embedding technique was carried out and

sections were taken at 5 µm thickness, stained with hematoxylin and eosin and examined microscopically for cyto-architectural changes Ann (1972).

RESULTS AND DISCUSSION

PCM, used as a tool to induce hepatotoxicity in experimental animals, leads to covalent bonding of its toxic metabolite N-acetyl P bezoquinoneimine to sulfhydryl groups of proteins. This causes exhaustion of reduced glutathione in the liver, resulting in cell necrosis and lipid peroxidation (Burke *et al.*, 2005, 2006).

The administration of PCM to the animals resulted in a significant disruption in the cytoarchitecture of the liver of animals in Group I (Fig. 1a, b). Groups II and III (Fig. 1c, d) the toxic effect of paracetamol was partly reversed in the animals, compared with the experimental control group (Group IV) (Fig. 1e) that was administered phosphate buffered saline only. Group II showed greater hepato-regeneration than group III, considering the photomicrograph. Histology of the control group showed normal hepatic cytoarchitecture (Group IV). The animals in group I exhibited areas of hepatic necrosis induced by paracetamol (slide A & B). The animals treated with PCM and *Ocimum sanctum* (Group II and III), (photomicrograph C and D, respectively) revealed appreciable regeneration of hepatic tissue.

Critical examination of photomicrographs A and B reveals absence of binucleate cells and also disrupted fine vascular sinusoids. It also revealed occlusion of the hepatic central vein. And these features are absent in

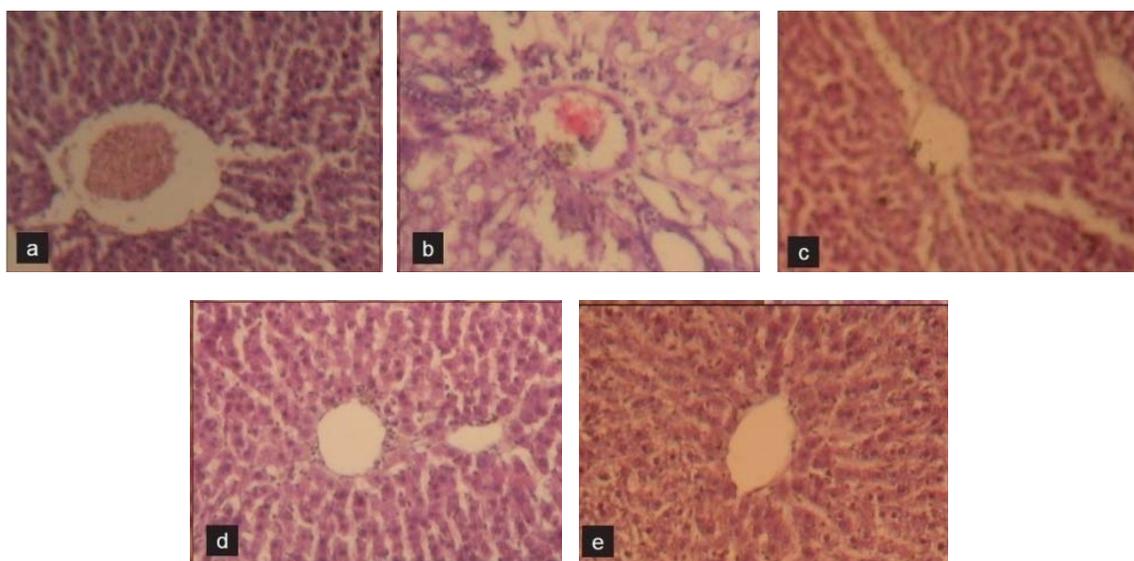


Fig. 1: (a) and (b) this shows the photomicrograph of the liver of the group administered with 2g/kg BW of PCM only (Group I); (c) and (d) this shows the photomicrograph of the liver of the group administered with 100 mg/kg BW and 200 mg/Kg BW + PCM (Group III and II) of ocimum sanctum respectively; (e) shows the photomicrograph of the liver of the control group administered with PBS only (Group IV)

photomicrographs C and D (Group III and II) respectively. Which reveals regenerative activities of the extract?

Administration of the aqueous extract of *Ocimum sanctum* leaves showed significant hepatoregenerative activity, as shown previously in other studies where alcoholic extract was used Chattopadhyay *et al.* (1992).

CONCLUSION

The aqueous extract of *Ocimum sanctum* has hepatoregenerative properties as evident by re-establishment of almost a normal liver cytoarchitecture after exposure of the experimental animals to PCM which was used as a hepatotoxin.

Therefore keeping the various medicinal benefits insight, research is called to be attempted in the isolation of its active ingredients regarding its chemical nature and bio-pharmacological activities.

REFERENCES

- Ann, P., 1972. Manual for Histologic Technicians. 3rd Edn., Little, Brown and Co., Boston, pp: 260.
- Burke, A., E. Smyth and G.A. Fitzgerald, 2005. Analgesic-Antipyretic Agents: Pharmacotherapy of Gout. In: Brunton, L.L., J.S. Lazo and K.L. Parker (Eds.), Goodman and Gilman's the Pharmacological Basis of Therapeutics. 11th Edn., McGraw-Hill, New York, pp: 706.
- Burke, A., E. Smyth and G.A. Fitzgerald, 2006. Analgesic-Antipyretic Agents: Pharmacotherapy of Gout. In: Brunton, L.L., J.S. Lazo and K.L. Parker (Eds.), Goodman and Gilman's the Pharmacological Basis of Therapeutics. 11th Edn., McGraw Hill, USA, pp: 694.
- Chattopadhyay, R.R., S.K. Sarkar, S. Ganguly, C. Medda and T.K. Basu, 1992. Hepatoprotective activity of *Ocimum sanctum* leaf extract against paracetamol induced hepatic damage in rats. Ind. J. Pharmacol., 24: 163-165.
- CPCSEA, 2003. Guidelines for laboratory animal facility. Committee for the purpose of control and supervision of experiments on animals. Ind. J. Pharmacol., 35: 257-74.
- Gupta, S.S., 1994. Prospects and perspectives of natural plant products in medicine. Ind. J. Pharmacol., 2: 1-12.
- Satyavati, G.V., M.K. Raina and M. Sharma, 1987. Medicinal plants of India (II). Indian Council of Medical Research, New Delhi.
- World Health Organization, 2008. WHO Media Centre: Traditional Medicine. WHO Fact Sheet Number 134, Retrieved from: <http://www.who.int/mediacentre/factsheets/fs134/en/>.