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# Aqueous Extract Of *Spondias mombin* (HOG PLUM) Could Possess Hepatocytic Potentials After Ingestion Of Monosodium Glutamate (MSG) By Wistar Rats

**Eze-Steven PE,** [1] **Neboh EE.** [2]

[1]Department of Applied Biochemistry, Faculty of Applied Natural Sciences, Enugu State University of Science and Technology, Enugu State, Nigeria.
[2]Department of Medical Biochemistry, Faculty of Basic Medical Sciences, College of Medicine, Enugu State University of Science and Technology, Enugu State, Nigeria.

***Author for Correspondence:** peter.ezesteven@esut.edu.ng

**ABSTRACT**

Intake of chemicals like monosodium glutamate (MSG), mostly used as food seasoning, enhance the prevalence of leiomyoma. Leiomyoma has no known cure but *Spondias mombin* leaves have been in use, locally, in its management among Igbos of South-Eastern Nigeria. This work investigated the effect of *S. mombin* extract on hepatocytes after ingesting MSG. Twenty-one rats used in this study were divided into three groups of seven rats each and acclimatized. Two groups had fibroid after daily ingestion of 750mg/kg body weight of MSG for 28 days. Negative control had no fibroid. Positive control had fibroid and remained untreated. Group III, with fibroid, were continuously fed with same dose of MSG for the next 28 days in addition to daily oral treatment with 250mg/kg body weight of aqueous extract of *Spondias mombin.* Histological examinations of rat's hepatocytes were performed on 2$^{nd}$and 4$^{th}$weeks, respectively, using two rats from each group for the next 28 days. Results indicated that the aqueous extract of *S. mombin* did not preserve rat's hepatocytes. Ingestion of *S. mombin* aqueous extract is deleterious to hepatocytes and could lead to other liver diseases. Results further indicated that continuous ingestion of MSG is destructive to hepatocytes. Care should be applied while ingesting aqueous extract of *S. mombin* either as a prophylaxis or as a chemotherapeutic agent. Result of this study had shown that oral intake of MSG has the potential of inducing uterine leiomyoma in experimental albino Wistar rats.

**Keywords:** Fibroid, monosodium glutamate (MSG), *Spondias mombin*, hepatocytes.

## INTRODUCTION

Civilization has made the use of chemicals an essential part of human life. These chemicals, mostly synthetic products, have found entry into human diets. They are used as food seasoning agents and include monosodium glutamate (MSG) (Sharma *et al*. 2013). Monosodium glutamate is an endocrine disruptor (WHO/UNEP, 2013) which is toxic to humans and experimental animals (Egbuonu *et al*. 2010). Once ingested, MSG initiates the excessive generation of reactive oxygen species (ROS) (Sharma, 2015). MSG is a bleaching agent used in laundry for stain removal (Olugbenga *et al*. 2014), and has been reported to induce leiomyoma in laboratory female Wistar rats (Eze-Steven, 2019). The incidence of fibroid, in Nigeria, is high among reproductive-aged women and it ranges from 17.9 – 26% compared to 5 – 11% reported in Europe and United States (Ekine *et al*. 2015).

The choice of alternative medicine in treatment of diseases is on the increase with Spondias mombin Linn used in the treatment of postpartum infections (Uchendu and Isek, 2008). However, the effect of this plant on hepatocytes has not been investigated, hence this study. The objective of this study is to investigate the effects of *Spondias mombin* leaf extracts on hepatocytes of female Wistar rats ingested with monosodium glutamate induced leiyomyoma.

## MATERIALS AND METHODS

### Study Setting

This study was carried out in the Industrial Biochemistry Research Laboratory at the Biochemistry Department of Enugu State University of Science and Technology (ESUT), Agbani, Enugu State and Histopathology Laboratory of ESUT Teaching Hospital, Enugu, Enugu State, Nigeria.

**Plant Materials**

Young fresh leaves of Hog plum (*Spondias mombin*) harvested from ESUT surroundings around 4.00pm were used. Leaves were identified by Professor J. C. Okafor, a Taxonomist with the Applied Biology and Biotechnology Department, Enugu State University of Science and Technology, Enugu State. Aqueous extract was prepared using Soxhlet method described by Redfern *et al*. (2014).

**Animal Studies**

Apparently-healthy adult female Wistar albino rats of about 6 to 8 weeks old with average weight of 150 to 250g were the experimental animals used for this research study. Rats were confirmed as adults following the method described by Lenschow *et al*. (2017). All the rats were obtained from Faculty of Veterinary Sciences, University of Nigeria, Nsukka (UNN).

**Preparation of Monosodium Glutamate (MSG) Solution**

The solutions of the MSG given to all animals were prepared following the dissolution of a calculated volume of MSG in a warm water (MSG is sparingly soluble in cold water/water at room temperature but readily soluble in hot water). (Eze-Steven, 2019)

**Experimental Design**

**Leiomyoma Induction and Extract Administration**

Twenty-one (21) adult female Albino Wistar rats were used in this study. Animals were acclimatized for two (2) weeks and divided into three (3) groups of seven (7) rats each. All animals were fed orally according to the methods described by Wheatley, (2002).

The negative control group was fed on poultry growers' mash and water only. The positive control group received feed, water and 750mg/kgbw of MSG daily for twenty-eight (28) days. Group III rats received feed, water and 750mg/kgbw of MSG daily for twenty-eight (28) days and were later treated with 250mg/kgbw of aqueous extract of hog plum daily while receiving food, water and 750mg/kgbw of MSG for another twenty-eight (28) days.

Leiomyoma was induced in rats in the positive control and Group III following the initial administration of 750mg/kgbw of MSG daily for twenty-eight (28) days. Group III rats continued to receive MSG with the *Spondias mombin* extract in the second twenty-eight (28) days as specified above according to the method described by Cheng *et al*. (2011).

Histopathology procedures carried out on rats' hepatocytes were according to the method described by Slaoui and Fiette, (2011) using haematoxylin and Eosin (H&E) staining technique.

## RESULTS AND DISCUSSION

**Photomicrographs of tissues of negative control female albino Wistar rat compared with the positive control.**

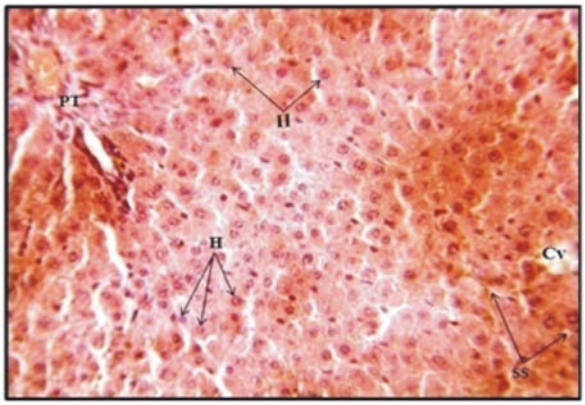


**Fig 1:** Liver section photomicrograph of Negative Control rat showing normal histoarchitecture of the hepatic tissue. The central vein (Cv), hepatocytes (H), portal tract (PT) and radiating sinusoidal spaces (SS) appear normal. (Stain: H&E; Mag: -x400)

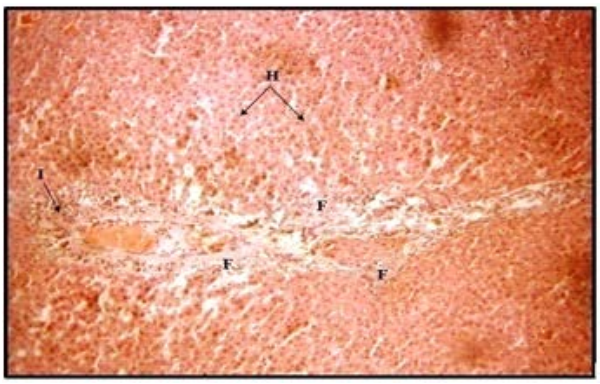


**Fig 2:** Liver section photomicrograph from Positive Control rats following MSG intoxication and not treated with the extract. There is evidence of cellular infiltration (I), tissue degeneration and septal fibrosis (F). However, most hepatocytes (H) within the hepatic lobule are normal. (Stain: H&E; Mag: - x100)

**Photomicrographs of tissues of Group III female albino Wistar rats treated with water extract of *Spondias mombin* leaves.**

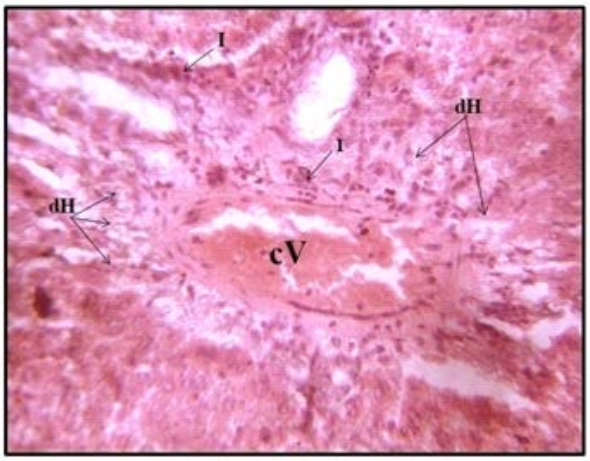


**Fig 3:** Liver section photomicrograph of Group III rat treated with 250mg/kgbw of *Spondias mombin* for two weeks following MSG intoxication and showing congested vessel (cV), degenerating hepatocytes (dH) and inflammatory cellular infiltration (I). (Stain: H&E; Mag: x400)

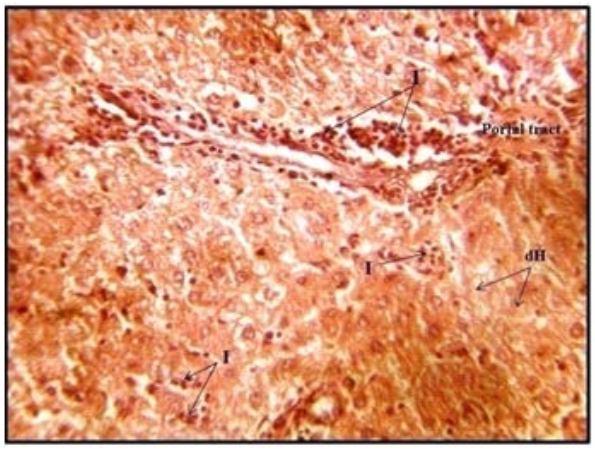


**Fig 4:** Liver section photomicrograph of Group III rat treated with 250mg/kgbw of *Spondias mombin* water extract for four weeks following MSG intoxication showing degenerating hepatocytes (dH) and inflammatory cellular infiltration (I). (Stain: H&E; Mag: - x400)

The photomicrograph of the liver section of Negative Control rat show normal histoarchitecture of the hepatic tissue as shown in Fig 1.

Liver section of the Positive Control rat shows evidence of cellular infiltration and tissue degeneration (Fig 2) compared to Negative Control rat (Fig 1). The evidence of tissue degeneration as seen in Fig 2 is an indication of the oxidative powers of monosodium glutamate (MSG) ingestion. The liver, which is the major site of drug metabolism, was destroyed by the ingested monosodium glutamate.

Also, the rat's hepatocytes at two weeks of treatment gave evidence of degeneration (Fig 3) and same occurred at the fourth weeks of continuous treatment (Fig 4).

The effective dose (ED) of MSG in rats has been reported as 750mg/kg bw by Eze-Steven *et al*. (2019). At this dose, the ingestion of MSG yielded hepatotoxic and nephro-destructive damages. This could be due to its oxidizing effect on organs and tissues like the liver, which is the major cite of drug detoxifications. Monosodium glutamate ingestion has also been reported to cause degeneration of kidney cells and uterine walls (Eze-Steven *et al.* 2019) arising from its oxidative properties. This oxidative damage supports findings indicating the hepatotoxic effects of MSG (Kazmi *et al.* 2017).

There was haemorrhage and cellular infiltration in week 2 of MSG ingestion with *Spondias mombin* treatment and same occurred in week 4. Therefore, continuous intake of *S. mombin* aqueous extract did not preserve the hepatocytes as compared to its effect on kidney and endometrial cells of rats following the ingestion of MSG as reported by Eze-Steven (2019). Aqueous extract of *S. mombin* leaves indicated no potency in preserving the hepatocytes of laboratory test animals from the oxidative damage of MSG. This is an indication that the intake of *S. mombin* could not preserve the integrity of the rats' hepatocytes. *Spondias mombin* aqueous extract offered protection to endometrial cells induced with leiomyoma (Eze-Steven, 2019 and Eze-Steven *et al.* 2019) hence its use in treating postpartum infections (Uchendu and Isek, 2008). However, continuous use of this extract destroys hepatocytes.

## CONCLUSION

In conclusion, aqueous extract of Spondias mombin should be ingested with caution to avoid the oxidative destruction it exerts on hepatocytes.

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