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Assessment of the Effect of Ethanolic Leaf Extract of Lemon Grass (*Cymbopogon citratus*) on Lung Histology of Treated Wistar Rats

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The aim of this study was to evaluate the effect of ethanolic leaf extract of lemongrass on body lung histology of treated wistar rats. Freshly harvested leaves of lemongrass were dried at room temperature and afterwards ground into fine powder. 250 g of powdered plant sample was suspended in 1000 mL of 95% ethanol for 72 hours and agitated thrice daily. The resulting extract was concentrated. Twenty adult male wistar rats were divided into four groups of five rats. Group I was the Normal Control, Group II was administered with 100 mg/kg b.w of ethanolic extract of lemongrass, Group III was administered with 300 mg/kg b.w of ethanolic extract of lemongrass, and Group IV was administered with 600 mg/kg b.w of ethanolic extract of lemongrass. Treatment lasted for 14 days after which subsequently sacrificed. The lungs were harvested for histological examination which was carried out using standard procedures. Oral administration of ethanolic leaf extract of lemongrass significantly ($P<0.05$) decreased body weight of treated rats compared to their untreated counterpart. The histopathological report showed a mild to moderate congestion of

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blood vessels and inflammatory cells around the bronchioles in the treated groups when compared to control. In conclusion, it can be deduced from this study that extract of lemongrass has the capacity to inflict harm to the lungs at high doses.

Keywords: Lemongrass; lung; histology; body weight.

1. INTRODUCTION

The lungs are the main organ of the respiratory system. It is saddled with the responsibility of transferring oxygen from the environment into bloodstream. The lungs wield the power to take over 6 million breaths per year. The lungs are situated in the chest, behind the ribcage on either sides of the heart. They are roughly conical in shape characterized by a rounded point at the apex and a flatter base where they meet the diaphragm. The lungs are susceptible to microbial infection primarily owing to its exposure to air drawn from the environment with its characteristic plethora of microorganisms many of which are pathogenic and which is responsible for over 6% of the global burden of diseases [1]. "It is worthy to note that microbes associated with lung infection are increasingly resistant to conventional antibiotics which in turn justify the need for trials on medicinal plants with broad spectrum antimicrobial property [2].

Lemon grass botanically known as *Cymbopogon citratus* is an aromatic perennial tall grass. It is characterized by stunted underground stems with ringed segments, coarse green slightly leathery leaves" [3]. "It is widely distributed in the tropical and sub-tropical countries. It reportedly originates from Asia, Africa and Americas" [4]. "The plant is a repository of assorted bioactive compounds which are critical in the management of diverse human ailments. It has demonstrated impressive activity against many pathogenic microbes known to inhabit the gastrointestinal tract [5]. Traditionally, tea from lemon grass is a popular antiseptic, antifever, antidyspetic, diuretic, transquilizer and anti-inflammatory agent [6]. Thus, it is imperative to investigate its safety on the lungs.

2. MATERIALS AND METHODS

2.1 Collection and Processing of Plant Material

Leaves of *Cymbopogon citratus* were harvested from a local farm, and washed in running tap water to remove dirts, they were subsequently authenticated in the herbarium unit of the Department of Botany, Chukwuemeka Odumegwu Ojuku, University, Uli Campus, Anambra State. The leaves were shade dried, ground and the resulting powder sieved and stored in an air tight container.

2.2 Preparation of Extract

"Exactly 250 g of powdered plant sample was suspended in 1000 mL of 95% ethanol for 72 hours and agitated thrice daily. It was then filtered using a muslin cloth and further filtration with Whatman No 1 filter paper. The filtrate was concentrated [7].

2.3 Animal

Twenty (20) adult male wistar rats weighing 120-180 g were obtained from the animal house of the Department of Anatomy, Chukwuemeka Odumegwu Ojukwu University and were allowed to acclimatize for two weeks, after which they were randomly divided into four groups of five rats each.

2.4 Acute Toxicity Test

Acute toxicity test was carried out according to the method of Lorke [8]. At the initial phase, Nine adult male wistar rats were divided into three rats per group and were orally administered with 10 mg, 100 mg and 1000 mg/kg body weight respectively. They were observed for 24 hours for signs of toxicity in the absence of which the second phase was commenced and constituted of 3 rats which were divided into 3 groups of 1 rat per group and was administered with 1600, 2,900 and 5,000 mg/kg bw of the extract. The LD_{50} was determined using the results obtained from the final phase as the square root of the product of the lowest lethal dose and the highest non-lethal dose.

2.5 Animal Grouping

Group I was administered with 2 mL of distilled water and fed with rat chow.

Group II received 100mg/kg of ethanolic leaf extract of *Cymbopogon citratus*

Group III received 300 mg/kg of ethanolic leaf extract of *Cymbopogon citratus*

Group IV received 600 mg/kg of ethanolic leaf extract of *Cymbopogon citratus*

The initial weight of animals was taken at the commencement of the study. Treatment lasted for 14 days after which the final weight was taken with the aid of an electronic weighing balance. Rats were subsequently sacrificed and the tissue harvested for histopathological examination.

2.6 Histological Studies

The liver tissue was dissected out and fixed in 10% formalin, dehydrated in gradual ethanol 80%, cleared in xylene and embedded in paraffin. Sections were prepared and then stained with hematoxylin and eosin (H and E) dye for photomicroscopic observation, including cell necrosis and fatty change.

3. RESULTS AND DISCUSSION

Hint: NCTRL [Normal control], ELG [Extract of Lemon Grass], GI-IV [Group I-IV]

The lungs are essential anatomical-physiological organ known for its respiratory and surfactant functions [9]. The use of plants in the management and prevention of diseases has been a practice among people living in Africa. *C. citratus* (lemongrass) is a medicinal plant known for its numerous medical applications. Findings from this study revealed that oral administration of ethanolic extract of *C. citratus* ($p<0.05$) decreased body weight compared to the control. The reduction in weight of rats administered with extract could be attributed to inhibition of the satiety centers in the hypothalamus resulting in alterations of metabolic balance and energy homeostasis. The outcome of this study is consistent with the finding of Rojas-Armas ***et al.",*** [10] who reported a significant reduction in the body weight following administration of essential oil of lemongrass on DMBA-induced breast cancer. Similarly, findings of Tiwari *et al.* [11] also reported a significant increase in the bodyweight following lemongrass oil on broiler chicks. The histopathological report showed a mild to moderate congestion of blood vessels and inflammatory cells around the bronchioles in the treated groups when compared to control. This could be attributed to the presence of some toxic phytoconstituents in the lemongrass. This study contradicts the report of Costa *et al.* [12] who reported no changes in the lungs histology following administration of the lemongrass oil.

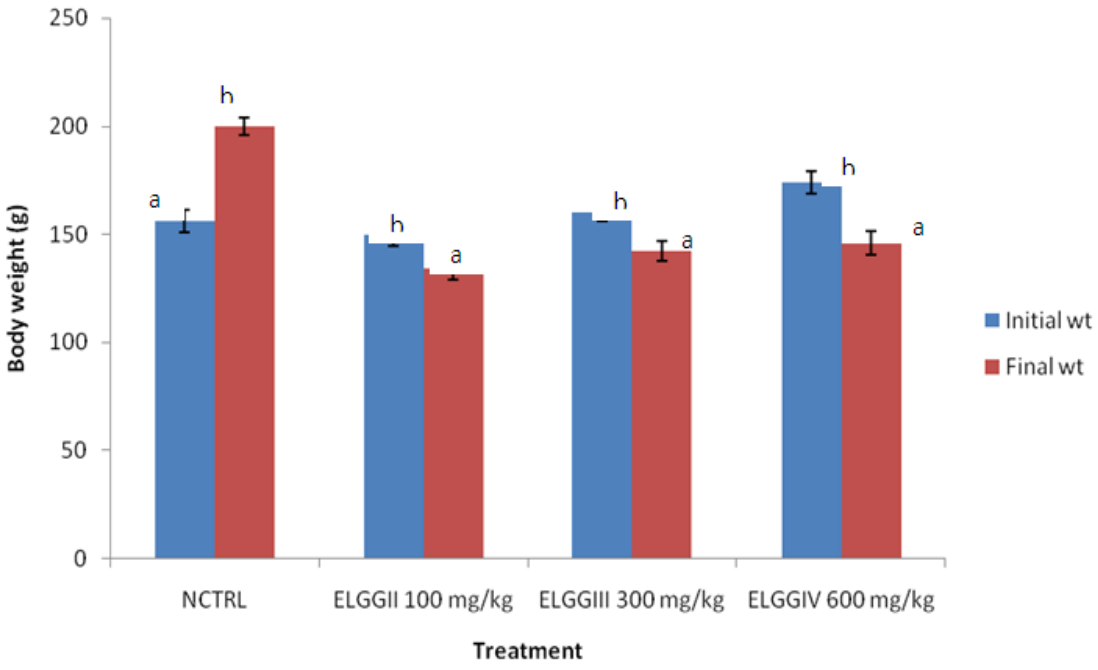

Fig. 1. Effect of ethanolic leaf extract of *Cymbopogon citratus* on the body weight

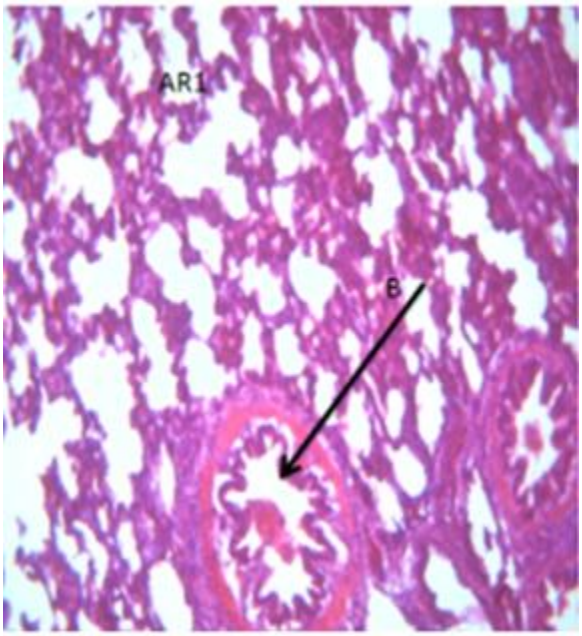

Plate I: Normal control (×100)

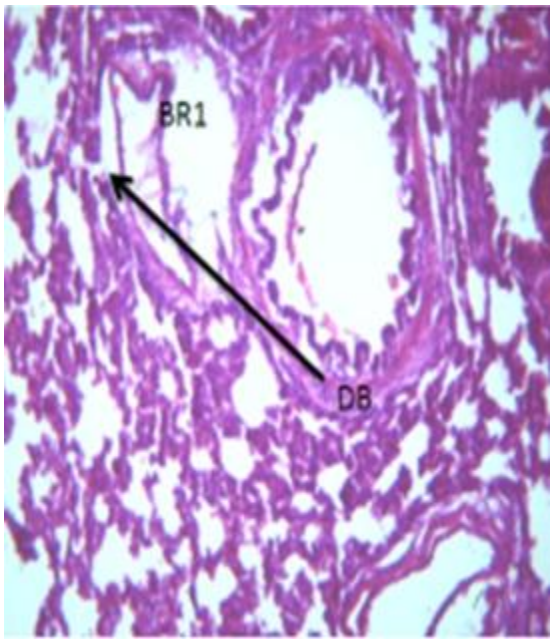

Plate II: 100 mg/kg of C. citratus extract (×100)

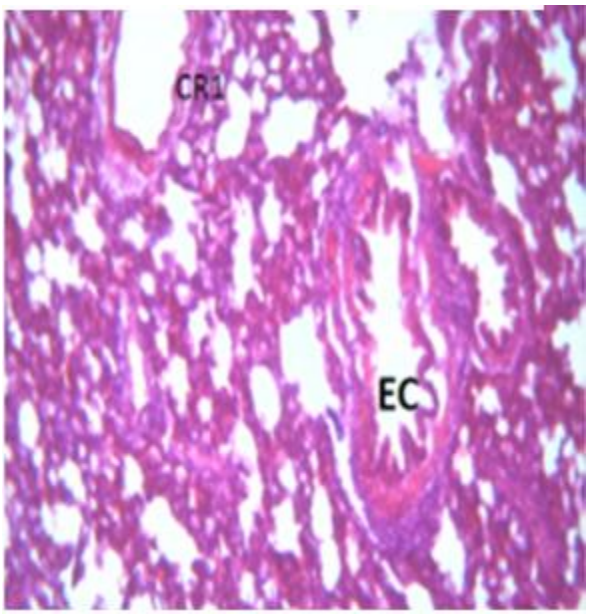

Plate III: 300 mg/kg of C. citratus extract (×100)

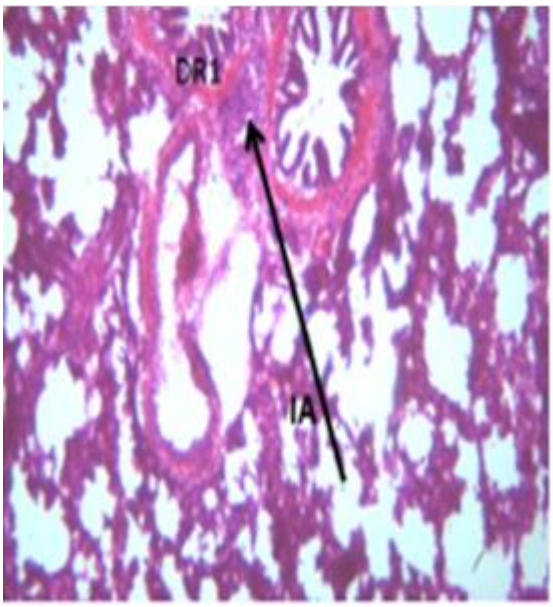

Plate IV: 600 mg/kg of *C. citratus* extract (×100)

Plate I: Photomicrograph of lungs of untreated rats (control group) showing normal lungs tissue with a well circumscribed alveoli, endothelial cells and bronchioles. Plate II: Photomicrograph of lungs of rats administered with 100 mg/kg of ethanolic leaf extract of *C. citratus* showing moderate inflammatory aggregate, congestion of blood vessel. Plate III: Photomicrograph of rats administered with 300 mg/kg of extract of *C. citratus* showing non-distent appearance of the endothelial cells. Plate IV: Photomicrograph of lungs of rats administered with 600 mg/kg of extract of *C. citratus* showing moderate inflammatory aggregate around the bronchioles and mild congestion of the blood vessels

4. CONCLUSION

It has been revealed through this work that extract of lemongrass has the capacity to inflict harm to the lungs at high doses.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical approval was granted by the universities Ethical Committee on Care and Handling of Laboratory Animals.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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