Microanatomical Effect of ethanolic extract of Garcinia kola on the lung of Swiss albino mice

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Abstract

Aims and Objectives: To histologically evaluate the possible effect of ethanolic extract of Garcinia kola seeds on the lung tissue in Swiss albino mice.

Methodology: Garcinia kola seeds were cut in pieces, oven dried at 40°C for 4 days and then grounded to a fine powder. The powder was extracted with ethanol (70% v/v) and concentrated and dried under vacuum. The animals were randomly assigned into groups A, B and C (n=10).Groups B and C were administered with 10 and 20mg/kg doses of the extract respectively; an equivalent volume of normal saline was given to group A (control group) for twenty one consecutive days. On the twenty second day the animals were sacrificed, the lungs excised and fixed in 10% formol saline for histological analysis.

Results: The treated groups present a dilatory effect on the alveolar ducts, alveolar sacs and alveoli. There was no observable loss of alveolar architecture, no emphysematous areas and no alveolar congestion in the treated groups.

Conclusion: It may be inferred from the present results that intake of G. kola seed extract for twenty one consecutive days improves respiratory activities which may be due to its antioxidant properties in Swiss albino mice.

INTRODUCTION

Garcinia kola is a medicinal plant grown in tropical rainforest in West-Africa ([1]). The height of the plant is approximately 14m and it produces reddish, yellowish or orange colour fruits containing 2 to 4 seeds ([2]). Extract from the bark of this plant are used in traditional medicine for treatment of liver cirrhosis and hepatitis ([3,4]). In Nigeria, the plant is valued for its edible nut. The plant exhibit pharmacological activities such as anti-inflammatory, anti-bacterial, anti-viral and anti-fungal properties([5,6,7,8]). Garcinia kola have been reported by the following authors: ([9,10,11,12]) to contain a complex mixture of prephenylated benxophenones, xanthones and biflavonoids. Garcinia kola by its biflavonoids content, possesses antioxidant properties. The production of antioxidant decline with age ([13]) and as such, requires nutritional suppliments. Administration of G. kola seed extracts caused an increase in testosterone production in Sprague-Dawley rats ([14,15]) due to the anti-oxidant properties of its constituents. Also, Adesanya et al ([2]) confirmed the spermatogenic and tissue enhancing effects of G. Kola extract in male Wistar rats. The medicinal use of plants leaves and roots in the management and treatment of diseases have been an age long practice ([16]). The continued investigation into the secondary plant metabolites has led to important breakthroughs in pharmacology.

The lung is the essential respiratory organ in air-breathing vertebrates, the most primitive being the lungfish. The two lungs are located in the chest on either side of the heart. Their principal function is to transport oxygen from the atmosphere into the bloodstream, and to release carbon dioxide from the bloodstream into the atmosphere ([17]). This exchange of gases is accomplished in the mosaic of specialized cells that form millions of tiny, exceptionally thin-walled air sacs called alveoli. Lungs also have non respiratory functions which included influence on the concentration of biologically active substances and drugs in medicine; filter blood clots in the veins; serve as physical layer of soft, shock-absorbent for the heart; and filter out gas micro-bubbles occurring in the venous blood stream ([17]).

Evidence from the literatures showed that lots of researches on medicinal plant supplements are centered on other

visceral organs neglecting the lung in traditional alternative medicine. In view of the vital role of the lung vis-à-vis the possible side effect of this ornamental plants on visceral organs, we set to investigate the possible effect of ethanolic extract of G. kola seeds on the alveolar architecture of lung tissue in Swiss albino mice.

MATERIALS AND METHODS

PLANT MATERIALS

The seeds of G. kola were procured from a local market in Ile-Ife, Osun-State, Nigeria. It was identified in the Department of Botany, Igbinedion University, Okada, Nigeria, were a voucher was deposited at the Harbarium. The seeds were cut in pieces, oven dried at 40 ^{o} C for 4 days and then grounded to a fine powder.

PREPARATION OF EXTRACT

The powdered material (100g) was percolated with 70% ethanol. The extract obtained yield (29.15%). It was then concentrated to a semi-solid form using the rotary evaporator, weighed and administered orally at a dose of 10mg/kg and 20mg/kg as the plant extract for a period of twenty one consecutive days.

ANIMAL TREATMENT

Thirty Swiss male albino mice (27-30g) were used for the experiment. They were maintained under standard laboratory conditions in the Animal Holdings of Igbinedion University, Okada, Nigeria, and fed with standard pelleted diet and water ad libitum. The animals were randomly assigned into groups A, B and C (n=10).Groups B and C were administered with 10 and 20mg/kg doses of the extract respectively; an equivalent volume of normal saline was given to group A (control group) for twenty one consecutive days. On the twenty second day, the animals were sacrificed by cervical dislocation and the lungs excised. All experimental procedures followed the recommendations provided in the "Guide for the Care and Use of Laboratory Animals" (National Academy Press, 1996)

HISTOLOGICAL PROCEDURE

Histological examination was done by fixing the lungs tissues of the mice in 10% formol saline, processed and embedded in paraffin wax. Tissue blocks were sectioned at 5 µm thick and stained with Haematoxylin and Eosin (H & E).

RESULTS

Sections of lung tissue in both the control and treated groups (Fig. 1-3), have the appearance of fine lace because most of the lung is composed of thin-walled alveoli. The alveoli are composed of a single layer of flattened epithelial cells. Between the alveoli are thin layer of septum and numerous capillaries also lined with simple squamous epithelium. The extract presents a positive effect on the alveolar architecture. There was no observable loss of alveolar architecture, no emphysematous areas and no alveolar congestion in the treated groups.

Figure 1

Figure 1: Photomicrograph of the lung of group A (control) (Mag. x100)

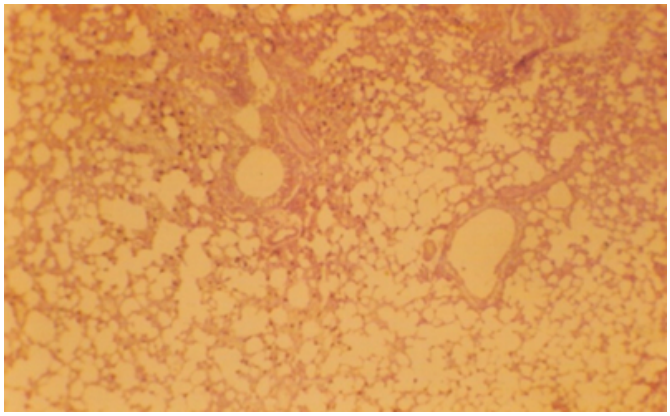


Figure 2

Figure 2: Photomicrograph of the lung of group B (Mag. x100)

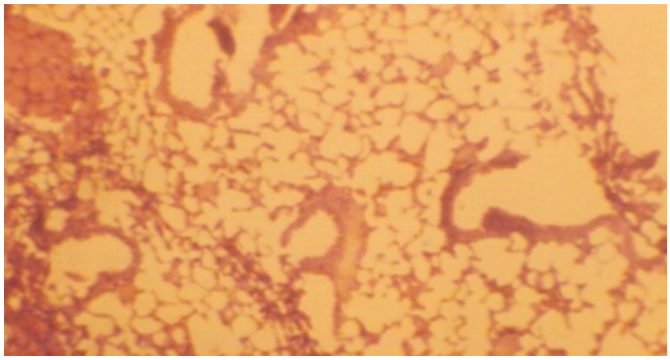
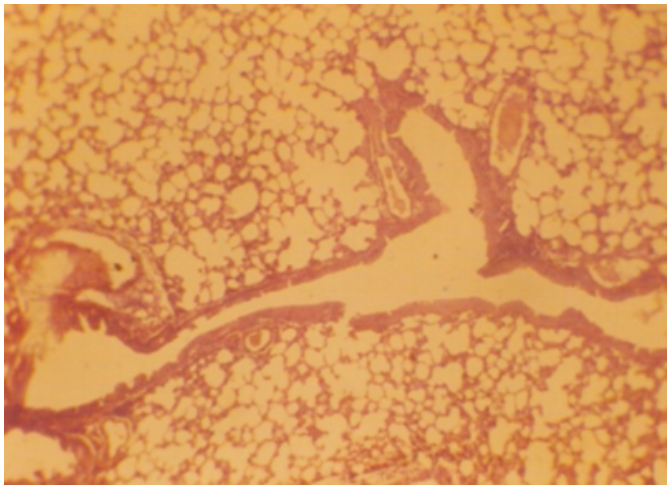


Figure 3

Figure 3: Photomicrograph of the lung of group C (Mag. x100)



DISCUSSION

The extract has demonstrated a very significant dose dependent positive role in alveolar ventilation. There was no loss of alveolar architecture, no emphysematous areas, and no alveolar congestion in the treated and control groups. The ultimate importance of pulmonary ventilatory system is to continually renew the air in the gas exchanged areas i.e. the alveoli, alveolar sacs, alveolar ducts and respiratory bronchioles ([18,19]). Report of Massaro and Massaro ([20]) showed that during normal quiet respiration, the volume of air in the tidal air is only enough to fill the respiratory passage ways down as far as the terminal bronchioles, with only a small portion of the inspired air actually flowing all the way in to the alveoli. The present investigation showed that G. kola extract exhibits a dilatory effect on the alveolar ducts, alveolar sacs and alveoli (Fig. 1-3) in the treated groups. This dilatory effect may be due to an improvement on the elastic fibers of the supporting tissue surrounding the alveolar ducts and the openings of the alveolar sacs and alveoli. The functional implication of this is that there will be an easy flow of air from the terminal bronchioles in to the alveoli thus, increasing the alveoli ventilation. This may be acting in synergy with type II pneumocytes which secrete surfactant which reduces surface tension within the alveoli preventing alveolar collapse during respiration. The dose dependent effect of G. kola extract on the alveoli architecture may be due to its biflavonoids content ([21]) which possesses antioxidant properties. Antioxidants protect cells from toxins by mopping up oxygen radicals produced from oxidative stress ([22]). Nutritional suppliments from plant sources such as G. kola exhibit promising pharmacological properties which can be exploited in the management of respiratory diseases such as asthma.

Finally, it can be concluded that ethanolic extract of G. kola improves respiratory activities which may be due to its antioxidant properties in Swiss albino mice.

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