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Full Length Research Paper

Some morphological changes on the kidney of adult Wistar rats following administration of crude extract of *Ocimum gratissimum*

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This study assessed the effect of leaf juice of *Ocimum gratissimum* used in the treatment of convulsion, epilepsy, malaria and stomach pain on the morphology of the kidney of Wistar rats. Thirty adult Wistar rats of both sexes were separated into 5 groups; A, B, C, D and E (n = 6 per group). The Wistar rats were subjected to different doses of aqueous extract of *O. gratissimum* leaves in order to determine the possible morphological changes in the kidney following the administration of the extract. The rats in group A were regarded as control and they received only distilled water throughout the period. The rats in group B, C, D and E were the treated groups and received aqueous extract of leaves of *O. gratissimum* daily at doses 0.4, 0.8, 1.6, 3.2 g / kg body weight orally for 15 days, respectively. The animal were sacrificed on the 16th day by cervical dislocation and the kidney excised, fixed in 10% formal saline and processed for light microscopy using H&E staining methods. Findings from rat weights showed that there was a significant (P < 0.05) decrease in the body weight of the treated rats compared with the control group. The histological study revealed dilation of the renal tubules as the doses increased while there was haemorhage at the interstitium and the glomeruli of treated rats. There was also focal interstitial chronic inflammation of the tissue with congestion of the blood vessels in the treated groups. The distorted kidney morphology, reduced bowan's space, increased luminar diameter and dilation of the renal tubules may adversely affect renal functions.

Key word: *Ocimum gratissimum*, kidney, morphology, bowman's space, distorted.

INTRODUCTION

Medicinal plants have contributed immensely to health care in Nigeria. This is due in part to the recognition of the value of traditional medical systems and the identification of medicinal plant from indigenous pharmacopoeias which have significant healing power (Mbata and Saikia, 2008). The consumption of a variety of local herbs and vegetables by man is believed to contribute significantly to the improvement of human heath, in terms of prevention or cure of diseases because plant have long served as useful and rational source of therapeutic agent (Roberts and Tyler, 1999). The use of plants for healing purposes predates human history and forms the origin of much modern medicine. *Ocimum gratissimum* like most medicinal plants contains appreciable amount of basic food nutrient and also rich in such chemical bases as alkaloid, flavonoid, saponin and tannin (Edeoga and Eriata, 2001). The crushed leaf juice of this plant is extensively used throughout west Africa in the treatment of convulsion, stomach pain and cattarrh, oil from the leaves have been found to possess antiseptics, antibacterial and antifungal activities (Ezekwesili et al., 2004). The kidney is a paired retroperitoneal organ on the posterior abdominal wall that helps to excrete waste products of protein metabolism from the blood while returning nutrient and chemical to the blood (Moore and Dalley, 2006).

The kidney is a chief regulator of all the body fluid and is primarily responsible for maintaining homeostasis or equilibrium of fluid and electrolytes of the body. The

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Figure 1. Longitudinal section of the kidney of rat in the group A or E? please check for consistency (control group).The renal corpuscle appeared normal. Bowman's space (BS), Proximal tubules (P),The Bowman's capsule and the glomeruli (G) were seen to be prominent and morphologically normal (H&E stains, Mg ×400).

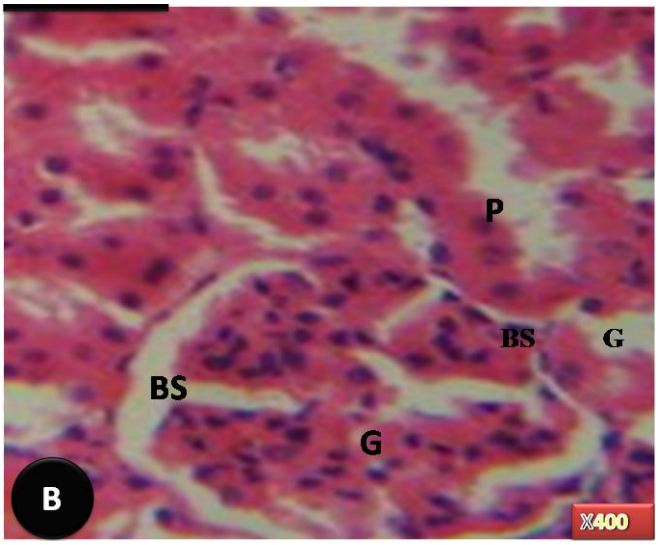

Figure 2. Longitudinal section of the kidney of rats in group B showing a slight increase in the luminal diameter of the renal tubules. Bowman's space (BS), glomeruli (G), Prximal tubules (P) (H&E stains, Mg ×400).

kidney main function is urine formation, regulation of acid- base balance, excretion of waste products of a metabolism and toxic substances, protein conservation, secretory functions and recovery of useful metabolites which filters through them (Williams et al., 1998). In view of the usage of this extract in the treatment of various ailments, this paper reported the possible effect of this extract on the kidney morphology in Wistar rats.

MATERIALS AND METHODS

Thirty male healthy Wistar rats with an average weight of 185 g were procured from the Animal house, Department of Physiology, Ladoke Akintola University of Technology, Ogbomoso, Nigeria. The rats were kept and maintained under standard laboratory conditions of temperature, humidity and light for a period of two weeks in the Animal holdings of the Department of Human Anatomy, Ladoke Akintola University of Technology, Ogbomoso, Oyo-state before the commencement of the experiment. During this course, the rats freely fed on pellets from Ladoke farms, Ibadan and were given distilled water *ad libitum*.

Experimental design and groupings

In the study, a total of 30 adult male Wistar rats were used. The rats were randomly separated into 5 groups of 6 rats each. Group B, C and D served as the experimental treated groups and received aqueous extract of *O. gratissimum* at varying doses. Group A served as the control group and received the same quantity of distilled water as contained in the experimental doses.

Administration of the aqueous extract of *O. gratissimum* was done orally by means of an oral canula. Group B, C and D received the aqueous extract of *O. gratissimum* at doses of 0.4, 0.8, 1.6, 3.2 g/Kg body weights, respectively for five consecutive days a week for three weeks (15 days). Rats in the control group (Group A) received quantity of distilled water as contained in the experimental doses.

At the end of the study (end of the third week), the rats were sacrificed by cervical dislocation. The abdomen of each rat was carefully dissected, the kidney removed and fixed in 10% formol saline for histological studies following the method of Carleton (1967).

RESULTS

The kidney section from group A control rats showed a normal renal corpuscle. The bowman capsule and the glomeruli appeared to be prominent and normal. The epithelial lining and connective tissue fibres and luminar diameter appeared normal in this section (Figure 1).

The kidney section from group B treated rats showed a slightly increased luminar diameter of the renal tubules particularly the collecting ducts. The morphological features appeared to be distorted with reduced bowman's space in Figure 2. The section from group C treated rats also showed increased luminar diameter of the renal tubules with occasional vacuolar degeneration of tubulercells. Distortion of the renal architecture with reduced Bowman's space is shown in Figure 3. The kidney section from group D treated rats showed congestion of the blood vessels with interstitial haemorrhage, increased dilatation of renal tubules, distortion and vacuolar degeneration of the tubular cells and loss of some cellular components of this treated section (Figure 4). The kidney section of the group E

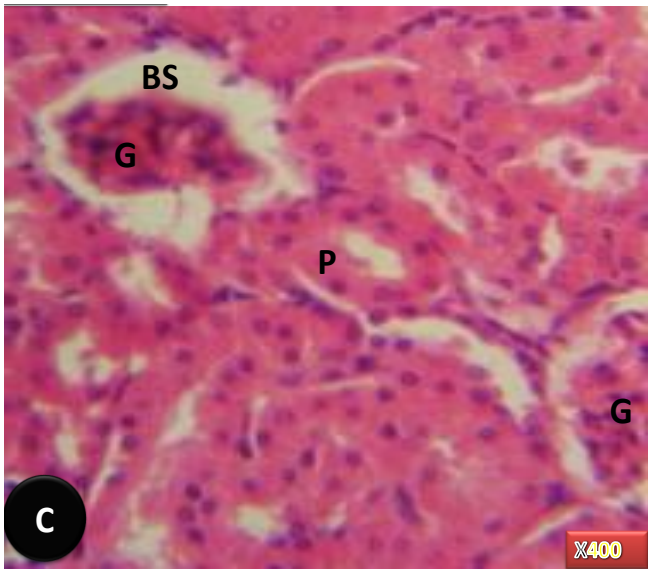

Figure 3. Longitudinal section of the kidney of rat in the group C. The tubular cells showing occassioanl vacuolar degeneration with further increase in the luminal diameter of the tubules. Proximal tubules (P), Bowman's space (BS), Glomeruli (G)(H&E stains, Mg ×400).

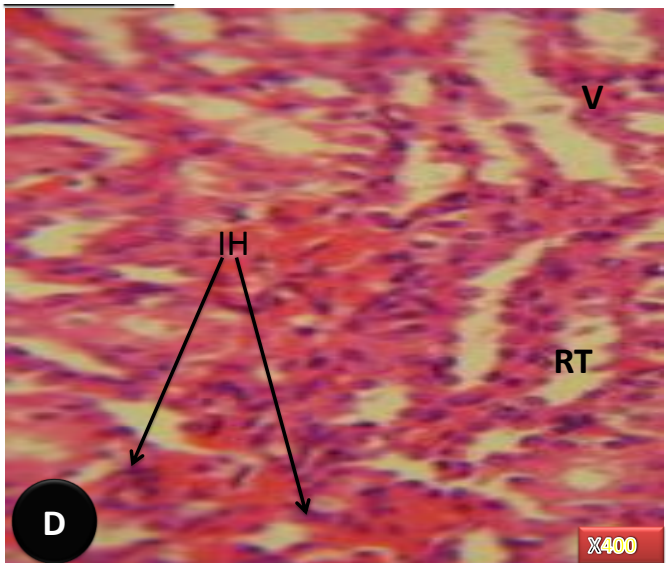

Figure 4. Longitudinal section of the kidney of rat in the group D showing congestion of the blood vessels (V) with interstitial hemorrhage (IH), the renal tubules (RT) are dilated. (H&E stains, Mag ×400).

treated rats showed congestion of the blood vessels with focal glomeruli haemorrhage, vacuolar degeneration of the tubular cells and distortions of the renal structures became more prominent in Figure 5.

DISCUSSION

O. gratissimuim is a plant used widely as medicinal herbs, phytochemical evaluation of this plant has shown that it is rich in alkaloid, saponin, tannin, phytates, flavonoids and oligosaccharides. It has tolerable cyanogenic content (Ijeh et al., 2004). The use of plant for medicinal purposes predates human history and forms the origin of modern medicine. Many synthetic drugs originated from plant sources (Vicker and Zollman, 1999). The medicinal values of the *Ocimum* species lie in their component phytochemical which produces physiological actions on the human body (Afolabi et al., 2007).

The results of this study shows that the aqueous leaf extract of *o. gratissimum* administered at different doses caused a significant ($P < 0.05$) decrease in the body weight of the treated rats when compared with the control. The increase in the luminar diameter in the treated rats might be an indication that the extract has adversely affected the renal clearance which may consequently result in diuresis. This finding is consistent with the earlier report of Effraim et al. (2003) which stated that animals that received higher doses of ocimum extract showed greater dilation in the renal tubules particularly the collecting tubules. Similarly, Breener et al. (1972) have noted that most waste products are poorly reabsorbed by the renal tubules and the effect of the extract will therefore be important for effective removal of waste products from the kidney.

Furthermore, the treated rats revealed congestion of blood vessels vacuolar degeneration and reduced focal interstitial glomeruli haemorrhage and focal interstitial chronic inflammation. The congestion of the blood vessels might be due to haemorrhage. Spinelli et al. (1972) have explained that the glomerular capillaries form a complex network of channels that anastomosse freely in mammals. The total area available for filtration in this complex network is a function of the length, diameter and number of capillary branched (Brenner et al., 1972). Moreover, the specific morphology of the capillary network including the capillary dimensions and the branching pattern as well as the properties of the blood determines the distribution of blood flow and thus the area used for filtration (Navar, 1978; Landis et al., 1963). Haemorrhiage is probably due to saponin found in the leaf extract (Irvine, 1961) as saponin is known to be toxic to body system (Watt and Breyer-Brandwijk, 1962). Renal function is impaired by any acute condition causing severe reduction in glomerular filtration. This occurs during the circulatory failure of the shock following severe trauma and haemorrhage. Impairment of renal blood flow and glomerular filtration occurs in some degree in most cases of acute diffuse proliferative glomerulonephritis (Muir, 1980). Chronic inflammation is characterized by the proliferation of fibroblast and production of vacuolar granulation tissue, this occurs particularly in prolonged

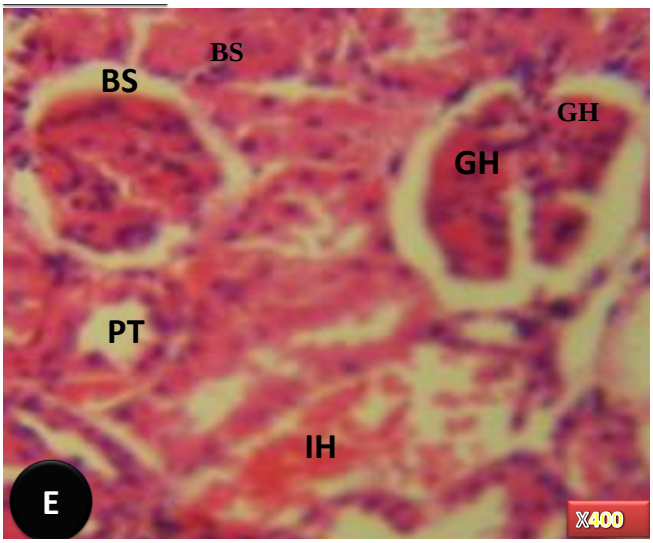

Figure 5. Longitudinal section of the kidney of the rats in group E showing a marked dilation of the proximal tubules(**PT**), congestion of the blood vessel, interstitial hemorrhage (**IH**) and glomeruli hemorrhage (GH) (H&E stains, Mg × 40).

tissue injury (Muir, 1980). This condition results when there is an injuiry to the tissue which is either due to bacteria, trauma chemical, heat or any other phenomenon (Guyton and Hall, 2000).

This study concluded that administration of chronic doses of *O. gratissimum* to Wistar rats resulted in decreased body weight, decrease bowman space, vacuolar degeneration, dilation of renal tubules, congestion of blood vessels, haemorrahage in the glomeruli and interstitium of the treated rats. This is an indication that the extract has adversely affected the kidney morphological features which may consequently impair renal functions in the treated rats.

It is recommended from this study that further studies should be carried out particularly on the physiological and biochemical parameters in relation to renal functions with the aim of corroborating the findings from this present morphological study.

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