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Effect of *A. precatorius* Aqueous Seed Extract on the Histology of Kidney, Lungs and Intestines of Wistar Rats

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ABSTRACT

This study was carried out to evaluate the potential effect of aqueous extract of *Abrus precatorius* (*A. precatorius*) seeds on the histology of kidneys, lungs and intestines of Wistar rats. Aqueous extract of *A. precatorius* seeds was administered for fourteen days through intraperitoneal route (i.p) to age matched Wistar rats. The rats were grouped into four with five rats per group. The control group was administered 3 mL kg^{-1} distilled water while the treatment groups were administered 0.05, 0.10 and 0.20 mg kg^{-1} of aqueous extract of *A. precatorius* seeds. The animals were sacrificed after fourteen days. The kidneys, lungs, small and large intestine were removed, weighed and preserved in 10% formalin solution and embedded in paraffin wax. Tissues from these organs were stained for assessment of tissue morphology. Pathological changes were observed in the tissues of the treatment groups while no change was observed in the control group. The median lethal dose (LD_{50}) was determined to be 0.35 mg kg^{-1} (i.p). The results showed that intraperitoneal administration of aqueous extract of *A. precatorius* seeds may cause slight changes to these organs and caution should be exhibited in its use in traditional medicine.

Key words: *A. precatorius*, pathology, intraperitoneal, toxic

INTRODUCTION

A. precatorius is an annual plant that has a small, high climbing tropical vine, with alternately compound leaves. The seeds are oval-shaped, usually brilliant red and have a jet-black spot surrounding the hilum. It has been reported that the seeds have antimicrobial activity (Saxena and Vyas, 1986). The roots, stems, leaves and seeds are reported to possesses different pharmacological activities including antimicrobial (Adelowotan *et al*., 2008; Bobbarala and Vadlapudi, 2009), anti-infertility (Ross, 2005), anti-implantation (Okoko *et al*., 2010), antibacterial (Zore *et al*., 2007), antitumor (Ghosh and Maiti, 2007), immunopotentiating (Ramnath *et al*., 2002) and anti-inflammatory activities (Georgewill and Georgewill, 2009). Toxicological studies carried out on *A. precatorius* leaves aqueous extract showed decreased in levels of some haematological parameters and increase in levels of some biochemical parameters (Adedapo *et al*., 2007). Toxicity studies carried out on the seeds of *A. precatorius* showed decrease in body weight, feed and water intake, decrease and increase in level of some haematological and biochemical parameters

(Sunday *et al*., 2013). Hence, this present study was carried out to evaluate the potential effect of aqueous extract of *A. precatorius* seeds on the histology of kidneys, lungs and intestines due to its common use in traditional medicine for the treatment of ailments.

MATERIALS AND METHODS

The animal experiments were performed according to the approved guidelines of Obafemi Awolowo University research ethics committee.

Plant collection and extraction: Dry seeds of *A. precatorius* plant, were obtained from a local market in Ile-Ife (Osun state) and identity of the plant was confirmed by Mr. G. Ibhanesebhor of the Department of Botany, Faculty of Biological Sciences, Obafemi Awolowo University, Nigeria. A voucher specimen (No. 16282) was subsequently deposited at Ife-Herbarium, Obafemi Awolowo University, Ile-Ife, Nigeria. Dried seeds of *A. precatorius* were ground into powder. Powdered seeds (1.0 kg) went through extraction at room temperature with distilled water (5×1000 mls). The extract was concentrated in vacuo to give a residue (yield, 27.7% w/w).

Animals: Twenty Wister rats weighing between 150-200 g of both sexes were obtained from Animal House, Department of Pharmacology, Faculty of Pharmacy, Obafemi Awolowo University, Ile-Ife, Nigeria. They were kept in well ventilated polypopylene cages with steel grid floors and were given standard feed (produced by Ola Dokun, Ibadan, Nigeria) and water *ad libitum*. They were acclimatized with the environment at ambient temperature under natural day light/night conditions for two weeks before the start of the experiment.

Determination of median lethal dose (LD_{50}): LD_{50} of the plant extract was determined using the method of Lorke (1983):

- **Phase 1:** Nine rats randomly divided into three groups of three rats were given 10, 100 and 1000 mg extract kg^{-1} b.wt. (i.p). The rats were examined at 10, 30, 60 and 120 min and at 4, 6, 12 and 24 h for any sign of adverse effect and mortality. The number of deaths in each of the groups within 24 h was recorded. Based on the result of Phase 1, lower doses were chosen for phase 2
- **Phase 2:** Nine rats randomly divided into three groups of three rats were given 0.25, 0.5 and 0.1 mg extract kg^{-1} b.wt. (i.p). The rats were examined like that of phase 1. The LD_{50} is calculated as follows:

$$LD_{50} = \sqrt{(A \times B)}$$

where, A is the minimum dose that caused 100% mortality, B is the maximum dose that caused 0% mortality.

Administration of doses: The rats were randomly sorted into four groups of five rats per group. Group one served as the control group; the rats were administered 10 mL distilled water kg^{-1} b.wt. (i.p) while groups two, three and four were administered 0.05, 0.10 and 0.20 mg extract kg^{-1} b.wt. (i.p.), respectively for fourteen days.

Histopathology: On the 15th day of the experiment, the rats (one at a time) were euthanized in an air tight glass chamber saturated with chloroform, they were opened up surgically and the kidney, lung, small and large intestine were collected. The sections of the kidney, lung, small and large intestine were placed in a tissue cassette and fixed in 10% buffered formalin. The tissues were then processed routinely and were embedded in paraffin wax. Histological sections were cut at 5-6 μm and stained with routine Haematoxylin and Eosin (Drury and Wallington, 1973) for microscopic assessment.

RESULTS

Median lethal dose (LD_{50}): Aqueous seed extract of *A. precatorius* caused 100% death in rats at <24 h at 0.5 and 1.0 mg kg^{-1} b.wt. and 100% death in rats at 24-48 h at 10, 100 and 1000 mg kg^{-1} b.wt. The LD_{50} was determined to be 0.35 mg kg^{-1}.

Histopathology: Figure 1-3 showed the photomicrograph of the kidney, lung, small intestines and large intestine isolated from animals used as controls (As) and animals that were administered 0.05 mg kg^{-1} (Bs), 0.10 mg kg^{-1} (Cs) and 0.20 mg kg^{-1} (Ds) aqueous seed extract of *A. precatorius*, respectively. The results revealed that there was a progressive dose dependent degenerative change in these organs when compared to that of the control group.

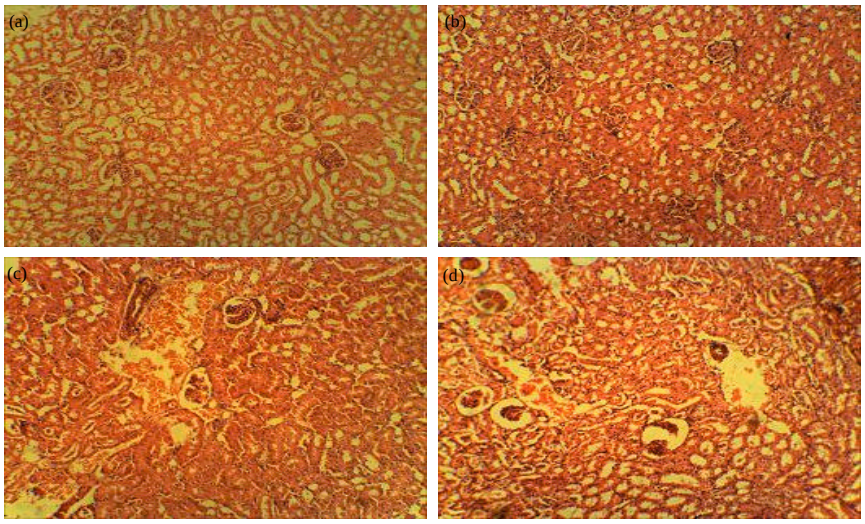


Fig. 1(a-d): Photomicrograph of the kidney of Wistar rats, (a) Control (X100 magnification), the architectural structure of the kidney was well preserved and outlined, the kidney cells appeared normal, (b) 0.05 mg kg^{-1} *A. precatorius* extract (X100 magnification), Numerous glomeruli was observable but they appeared to be full of cells and virtually solid signs of pathology, The kidney cells showed architectural disarray, (c) 0.10 mg kg^{-1} *A. precatorius* extract (X100 magnification), the kidney appeared diseased and only few glomeruli are preserved, and (d) 0.20 mg kg^{-1} *A. precatorius* extract (X100 magnification), the glomeruli appear to have completely solidified and shrunken and the parenchyma appearance of the kidney was also distorted

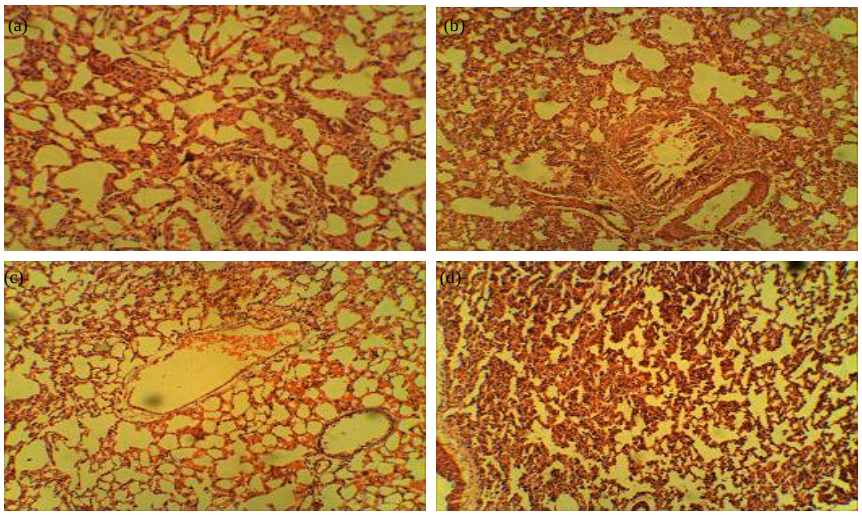


Fig. 2(a-d): Photomicrograph of the lungs of Wistar rats, (a) Control (X400 magnification), the tissues of the lung are well outlined, Bronchioles, veins, alveolar rings and sacs are visible, easily recognized and well outlined, The lung tissue appeared normal, (b) 0.05 mg kg^{-1} *A. precatorius* extract (X100 magnification), the lung shows well outlined bronchiole structure but the lung mass appeared clumsy and inflamed, (c) 0.10 mg kg^{-1} *A. precatorius* extract (X100 magnification) the bronchiole of the lungs show a sign of hemorrhage as red blood cells scatter throughout the lung tissue, the bronchial epithelium appeared thickened and squamous that is observable in a diseased state and (d) 0.20 mg kg^{-1} *A. precatorius* extract (X100 magnification), the lung tissue is heavily inflamed

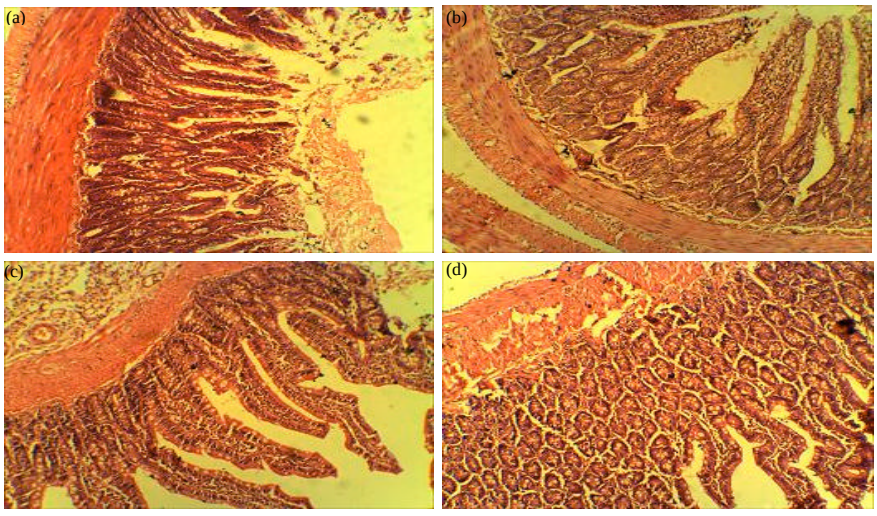


Fig. 3(a-h): Continue

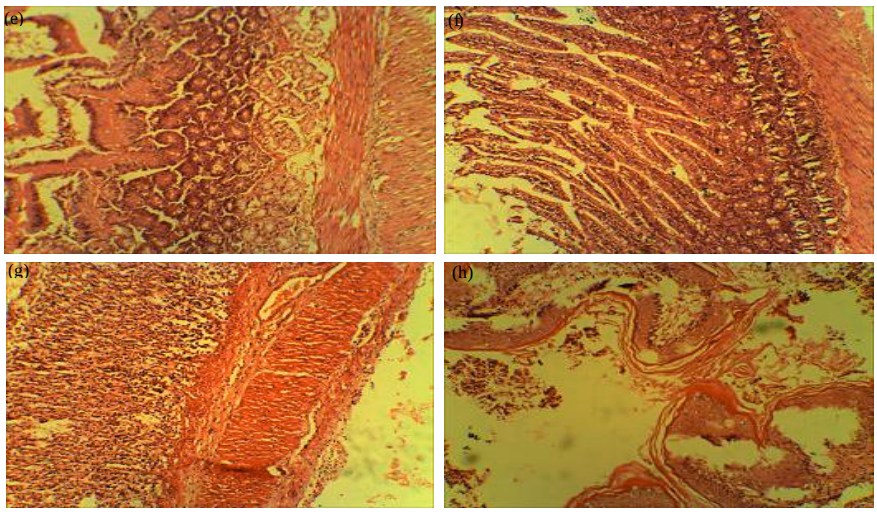


Fig. 3(a-h): Photomicrograph of intestine of Wistar rats, (a) Control:X400 (Large Intestine), the tissues of the large intestines are well outlined, intact and well preserved, (b) Control X400 (small intestine), the tissues of the small intestines are well outlined, intact and well preserved, (c) 0.05 mg kg^{-1} *A. precatorius* extract X400 magnification, the tissues of the small intestines are well outlined and well preserved, (d) 0.05 mg kg^{-1} *A. precatorius* extract X400 magnification, the tissues of the large intestines are well outlined and well preserved, (e) 0.10 mg kg^{-1} *A. precatorius* extract X400 magnification, the mucosa, especially the villi and epithelial structures showed some level of disruptions, (f) 0.10 mg kg^{-1} *A. precatorius* extract X400 magnification, the epithelial cells structure showed some level of disruptions, (g) 0.20 mg kg^{-1} *A. precatorius* extract X400 magnification the architecture of the large intestine especially the lumen was completely distorted and (h) 0.20 mg kg^{-1} *A. precatorius* extract X400 magnification, the small intestine shows severe ulcerations and the architecture was disrupted

DISCUSSION

This study was carried out to evaluate the potential effect of aqueous extract of *Abrus precatorius* (*A. precatorius*) seeds on the histology of kidneys, lungs and intestines of Wistar rats.

In this study, the median lethal dose (LD_{50}) indicated that the seed extract is moderately toxic in rodent model through i.p and death occurred depending on the dose administered. This finding is supportive evidence that the phytotoxins produced by the seed of *Abrus precatorius* has high toxic activity (Villasenor and Espinosa-Garcia, 2004). Histopathological examination revealed that *A. precatorius* aqueous seed extract caused a progressive and dose dependent degenerative changes in the kidneys, lungs, large and small intestines of Wistar rats when administered i.p. This finding is supportive evidence that the phytotoxins produced by the seeds of *A. precatorius* has high toxic activity due to the presence of a phytochemical known as abrin which is present in the seeds (Olsnes, 2004). Studies carried out on the leaves (Adedapo *et al*., 2007) and seeds extract

(Sunday *et al.*, 2013) showed significant changes in some haematological and biochemical parameters. Pathological observation of the kidney, lung and intestines of Wistar rats showed degenerative changes in the treatment groups while the control group pathology appeared normal.

CONCLUSION

In conclusion aqueous seed extract of *A. precatorius* may cause slight changes in the pathology of the kidney, lung and intestines when administered intraperitoneally. Hence, caution should be taken in its use in traditional medicine.

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