TOXICITY EVALUATION OF MORINGA OLEIFERA LEAVES

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ABSTRACT

A total of 24 adult albino (Wister stains) rat, Rattus norvegecus, were grouped into (four I, II III and IV each containing six rats). Group I was fed with 25%, group II was fed with 50% and group III was fed with 75% amended diet containing the powdered leaves of Moringa oleifera mixed with standard livestock feed (Grower mash) for 93 days. Group IV served as the control and was fed with the standard diet alone. At the end of the experiment, the animals were sacrificed and their vital organs were histopathologically examined. The result of the study revealed that some organs of the treated animals had observable microscopical lesions, while the control animals had no observable microscopic lesions in all the organs examined. The air-dried leaves of the plant were analysed using energy dispersive X-ray fluorescence (EDXRF) transmission emission technique. It was found that it contained among others the following elements in parts per million: Ca (1.29 x104 x 104 ± 500); K (7.2 x 103± 600); S (3.8 x 104 ± 500); Fe (4.53 x 102 ± 21); and Cl (1.44 x 102 ± 15). The presence of some of these constituents could be responsible for the observable microscopicall lesions. It could therefore be concluded that, indiscriminate large consumption of the leaves of M. oleifera as both food and medicine is not safe for a long period of time.

Keywords: *Moringa oleifer, Rattus norvegecus,* elemental analysis, histopathology.

INTRODUCTION

The plant, *Moringa oleifera* Lam. (*Syn. M. ptrygosperma* Gaertn) is of the family *Moringaceae.* It is a small graceful tree with sparse foliage, often planted in compounds or used as fence in Northern Nigeria. It is a deciduous plant and could grow up to 8 m height [8]. The plant is commonly called horse-radish tree and locally known as 'Zogalegandi' in Hausa, 'Eweigbale' in Yoruba and 'Okweoyibo' in Igbo [4]. *M. oleifera* is well known for its nutritional as well as medicinal values by many communities in Northern Nigeria. The leaf of this plant is used as vegetable in soup preparation or cooked and mixed with grounded groundnut cake and other spices then eaten as food. Medicinally, the plant was reported to exhibit anti-inflammatory, anti-hypertensive and anti-ulcer activities [5, 11]. It was also known to possess anti – bacterial activity against *Bacillus subtilis, Mycobacterium phlei, Staphylococcus aureus, Salmonella* and Shigella species [3, 13]. The plant is also well known in traditional therapies as arbotifacient and infertility control [10, 14]. Phytochemical investigation on the plant revealed the presence of moringine and moringinine alkalodis in the root; pterygospermine alkaloid in the flower, fatty acids and fixed oils in the seed. Enzymes and bassorin substances were also found to be present in the exudates of this plant. Poisoning with metals is one of the oldest forms of toxicity known to man. However, it is only recently that the mechanisms of toxicity have become known. The symptoms of poisoning are related to the amount of the metals ingested or absorbed and to the duration of exposure [2]. The leaf of *M. oleifera* is consumed in large quantities because of its medicinal and nutritional values in Northern Nigeria. In view of the common use of this plant, both as food and as herbal medicine, this paper reports the histopathological studies and elemental analysis of *M. oleifera* in order to recommend its continued use or otherwise.

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MATERIALS AND METHODS

Plant Collection and identification

The plant was collected from around Dambo village of Sabongari Local Government Area, Kaduna State, Nigeria in the month of June, 2002. The Herbarium keepers at the Department of Biological Sciences, Ahmadu Bello University, Zaria Nigeria identified it as *Moringa oleifera* via taxonomic means, where a voucher specimen (No. 3317) was deposited.

Plant Preparation

The leaves of the plant were hand-picked, dried under shade and grounded to powder form using wooden pestle and mortar. It was then kept in plastic container under a dry condition for further use.

Elemental Analysis

Small portion of the powdered sample was used for the elemental analysis using an energy dispersing X-ray fluorescence (EDXRF) transmission emission technique, at the Centre for Energy Research and Training, Ahmadu Bello University, Zaria Nigeria [7].

Experimental Animal

Albino rats (Wister strains) were housed in a clean environment at the animal house, Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria. The animals were provided with food and water ad-libitum. Prior to the commencement of the experiment, the animals were pre-conditioned for two weeks and screened for diseases. The animal care and handling was conducted in compliance with the National Regulations for Animal Research. University Ethical committee reviewed the protocols, which were consistent with International Animal Welfare Guidelines.

Animal Treatment

Twenty – four rats of both sexes weighing between 80 and 120 g were divided into four groups of six animals each. They were allowed free access to drinking water and standard livestock feed (ECWA, Grower Mesh). The rats were kept under room temperature with day and night cycles. Group I rats were fed with 25% (w/w) amended diet, group II rats were fed with 50% (w/w) amended diet, group III rats were fed with 75% (w/w) amended diet, while group IV rats were the control and were fed with the standard diet only.

Preparation of Animal Diet

Three different concentrations of the diet were prepared using an ECWA Grower Mesh livestock feed. This was carried out by mixing 25% (w/w), 50% (w/w) and 75% (w/w) powdered plant material with the standard diet.

Preparation of organs Sample

On the 93rd day of the experiment, the animals were necropsied; their various tissues and organs were removed. The organs and tissues were fixed in 10% buffered neutral formalin for a minimum of 48 hours. This is to maintain the tissues near normal natural condition at ante-mortem. The tissues were later processed and examined microscopically following modified method [1].

RESULTS AND DISCUSSION

Result

This study described the evaluation of safety of the plant in relation to the elements present in the leaves of *Moringa oleifera.* The result of the Elemental analysis of the leaves showed that, the plant is rich in Ca ($1.29 \times 10^4 \pm 500$ppm), K (7.2×10^3) ± 600 ppm), S ($3.8 \times 10^{14} \times 10^4 \pm 500$ ppm), Fe (4.53×10^2 21 ppm) and Cl ($1.44 \times 10^2 \pm$ ppm). Histopathological report showed that, the livers of group III rats had fatty degenerations, focal areas of necrosis of hepatic cells with few mononuclear cellular infiltrations. The spleens had necrosis of lymphocytes and spleenic blood vessels. The brain had neuronal degenerations and necrosis of glial cells. The control groups rats had no any observable microscopical lesions in all the organs mentioned above. The air-dried leaf of the plant was analysed using energy dispersive x-ray fluorescence (EDXRF) transmission emission technique. It was found that it contains Ca $91.29 \times 10^4 \pm 500$ppm), K ($7.2 \times 10^3 \pm$ 600 ppm), S ($2.8 \times 10^{14} \pm 500$), Fe ($4.53 \times 10^2 \pm 21$ ppm) and Cl ($1.44 \times 10^2 \pm 15$ppm). Others include Mn (83 ±22) Cr ($1.26 \times 10^2 \pm 33$), Sr (69± 3), Rb (12±2),Zr (11± 2) and Mo (5 ± 1).

DISCUSSION

Considering the different elements analysed from this plant and its wide uses,; *Moringa olefera* had potentials of proving useful drugs for human , since the pharmacological activity of any plant is usually traced to its particular compound(s), [13]. Calcium plays a fundamental role in the constitution of biological systems; its presence in bone provides the animal with the required rigidity and support. It affects cell structure and functions by being indispensable for the overall integrity of the tissues[6]. The normal required plasma calcium concentration of 10 mg/100ml has to be maintained within narrow limit for an animal to carry out its varied functions and survival [12]. The presence of calcium ($1.29 \times 10^4 \pm$ 500 ppm), in the leaves of *M. oleifera* is therefore below the required needs of the body. Potassium exists primarily as an intracellular constituent in the body. Its deficiency results in nonspecific gross symptoms resulting in decreased content of the element in the heart and other organs, myocardial degeneration, renal tubular degeneration of the kidneys, muscular dystrophy and other pathological changes [9]. The requirement of this element is estimated to be 0.2 to 0.6% of the dry weight of the animals. The concentration of K ($7.2 \times 10^3 \pm 600$ ppm) in the leaves of *M. oleifera* is therefore

adequate and hence could not be responsible for the observed degenerations and necrosis of the cell of the experimental animals. However, the leave also contained some elements believed to be harmful such as Sr (69± 3), Rb (12 ± 2) and Zr (11±2) although they are within the least detectable limits. It could therefore be concluded that indiscriminate large consumption of leaf of *M. oleifera* collected from around Dambo village of Sabongari Local Government Area, Kaduna State, Nigeria to be consumed as both food and medicine is not safe for a long period of time.

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