

THE EFFECT OF AQUEOUS ROOT EXTRACT OF *MANNIPHYTON FULVUM* (MF) ON SERUM GLUCOSE CONCENTRATION AND MALONDIALDEHYDE (MDA) IN WISTAR ALBINO RATS TREATED WITH BONNY LIGHT CRUDE OIL (BLCO)

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ABSTRACT: The effect of aqueous root extract of *Manniphyton fulvum* (MF) on serum glucose concentration and malondialdehyde (MDA) was investigated in Wistar albino rats treated with bonny light crude oil (BLCO) for 14 days. From the study, oral administration of 5ml/kg body weight of BLCO alone caused a significant ($p < 0.05$) increase in serum glucose concentration and MDA level compared to control (group 1). However, oral administration of 170mg/kg body weight of aqueous root extract of MF (group 4) resulted to significant ($p < 0.05$) reduction in these parameters compared to group treated with BLCO alone (group 2). The result obtained from glucose concentration of group 4 was not significantly ($p > 0.05$) different when compared to group 1. Administration of 170mg/kg body of the aqueous root extract of MF alone caused significant ($P < 0.05$) reduction in MDA compared to control. The result obtained from this study indicated that combination of high serum glucose concentration and increased oxidative stress in BLCO treated groups caused an array of imbalances and associated toxicity. However, administration of aqueous root extract of MF restored the imbalances and ameliorated the toxic effect of BLCO on these parameters investigated in wistar albino rats.

KEYWORDS: bonny light crude oil, *Manniphyton fulvum*, serum glucose, malondialdehyde.

1 INTRODUCTION

In Nigeria, crude oil exploration and export is the mainstay of the economy and constitutes about 90% of the foreign exchange earnings of the nation. Its exploration and production exclusively takes place in the Niger Delta region of Nigeria and obtained from the oil field by workers and sold or distributed for the treatment of different kinds of sicknesses such as convulsions, burns due to the pharmacological properties it is believed to possess especially among the rural dwellers (Orisakwe *et al.*, 2004, Ujowundu *et al.*, 2014)). However, crude oil notwithstanding its benefits has a lot of negative impacts associated with it due to the complex mixture of hydrocarbons and heavy metals present in them (Deplege, 2002). Its production and exploration brings about pollution to the environment through oil spillages and living system upon exposure. The potential toxic effect of this crude oil is exerted on almost all organs of the body (Adedara *et al.*, 2012, Ita *et al.*, 2014, Okoye *et al.*, 2014).

Recently, low resistance in humans owing to toxicity has increased research and interest in uncovering the role and beneficial aspects of plant products to enhance physiological processes to protect major organs of the body. This is due to the presence of potent phytochemical constituents in plants.

Manniophyton fulvum belongs to the Euphorbiaceae family. It is commonly used in Nigeria because of its therapeutic and nutritional potentials. In African Traditional Medical System, different parts of this plant have been used to treat illnesses like cough, dysentery, haemorrhoids, erectile dysfunction, diarrhoea etc (Agbaire *et al.*, 2013, Ojeh *et al.*, 2013). *Manniophyton*

fulvum has been investigated to contain bioactive components like flavonoids, glycosides, saponins, benzoic acid derivatives, carotenoids, phytosterols and alligins; flavonoids being the most abundant (Agbaire *et al.*, 2013).

The aim of this study is to investigate the possible effect of aqueous root extract of *Manniophyton fulvum* on serum glucose concentration and malondialdehyde (MDA) in Wistar albino rats administered with bonny light crude oil.

2 MATERIALS AND METHODS

2.1 CRUDE OIL

Crude oil (Bonny Light BLCO) was obtained from the Nigerian National Petroleum Corporation (NNPC) Port Harcourt, Rivers State, Nigeria.

2.2 PLANT MATERIALS

Roots of *Manniophyton fulvum* were collected from Umuada Ngodo Isuochi, Umunneochi Local Government Area of Abia State Nigeria and were identified at the Department of Plant Science and Biotechnology, University of Port Harcourt, Nigeria. The roots were sorted, cleaned and air dried at room temperature.

2.3 PREPARATION OF AQUEOUS ROOT EXTRACTS

The dried roots were crushed into coarse powder with grinding machine and weighed. 1200g of the powder was directly soaked in 5L of hot water for 72hrs with intermittent shaking. The mixture was then filtered using a muslin cloth. The filtrate (extract) was evaporated to dryness under reduced pressure using rotary evaporator. The extract obtained was oven dried at a temperature of 40°C with a percentage yield of 1.14%. A stock solution of 0.1g/ml was prepared by dissolving 5g in 50ml of distilled water and stored in the refrigerator. The volume of stock administered was calculated based on body weights of the animals according to the formula given by Nwafor *et al.*, 2009.

$$\text{Volume of stock solution} = \frac{D \times P}{C} \quad (1)$$

Where D = dose to be administered, P = body weight of animal in kg, C = concentration of the stock solution.

2.4 ADMINISTRATION OF BONNY LIGHT CRUDE OIL (BLCO)

BLCO was administered orally to the animals. 5.0ml/ kg body of BLCO weight was continuously for 14 days (Oruambo and Dokubo, 2008).

2.5 ADMINISTRATION OF AQUEOUS ROOT EXTRACT OF *MANNIOPHYTON FULVUM* (MF)

One fifth of the LD50 (850mg/kg) (Agbaire *et al.*, 2013) was prepared as a fixed dose and administered to rats according to their body weights.

2.6 EXPERIMENTAL ANIMALS

A total of twenty-four (24) Wistar albino rats weighing between (170-200) g were used for this study. They were obtained from the animal house of the University of Port Harcourt, Nigeria. The animals were allowed to acclimatize in a wooden cage made of wire gauze for two weeks. Food and water were given *ad-libitum* prior to the commencement of the experiment. The study was conducted based on the guidelines for use and care for laboratory animals.

2.7 TREATMENT OF THE ANIMALS

The rats were later divided into four groups of six (6)

Rats each.

Group 1(control): not administered with any substance

Group 2: administered 5 ml/ Kg body weight of BLCO only

Group 3: administered 170 mg/Kg body weight of MF only

Group 4: administered 5 ml/ kg body weight of crude oil and 170mg/kg body weight of MF

All substances were administered orally through a tube attached to a 5ml syringe. After fourteen (14) Days of administration, the animals were starved overnight, subjected to light chloroform anesthesia and dissected.

2.8 COLLECTION OF BLOOD AND LIVER SAMPLES

Sterile syringe with needle (5ml) was used for collection of blood samples from the heart, by cardiac puncture. The blood sample was transferred into properly labeled sterile sample bottles and taken to the laboratory for assay. The liver of each animal was excised washed in 0.9% ice cold saline, weighed and homogenized with 5ml (50mM, pH 7.4) phosphate buffer to give a 10% (w/v) liver homogenate. The homogenate was centrifuged at 5000g for 15 min and the supernatant obtained for further analyses.

2.9 ESTIMATION OF BIOCHEMICAL PARAMETERS

Serum glucose concentration was determined using one-touch glucose strips and glucose meter (Johnson and Johnson USA). Lipid peroxidation was determined as malondialdehyde (MDA) according to the method described by Farombi et al., (2000).

2.10 STATISTICAL ANALYSIS

Values from this biochemical assays were expressed as mean (\pm) S.E.M for six rats in each group. Analysis of group data were carried out by one –way Analysis of the variance (ANOVA) and further subjected to post hoc test using (Turkey HSD). $P < 0.05$ was considered to be significant.

2.11 RESULTS

2.11.1 EFFECT OF MF ON SERUM GLUCOSE CONCENTRATION

Figure 1 showed the effect of oral administration of aqueous root extract of MF on serum glucose concentration of rats treated with BLCO. Serum glucose concentration of rats administered with BLCO only (group 2) showed significant ($p < 0.05$) increase compare to control (group 1) and other groups. In group 4 (BLCO+MF) there was significant reduction ($p < 0.05$) in serum glucose concentration compared to group 2. When compared to group 1 the serum glucose concentration was not significantly different ($p > 0.05$).

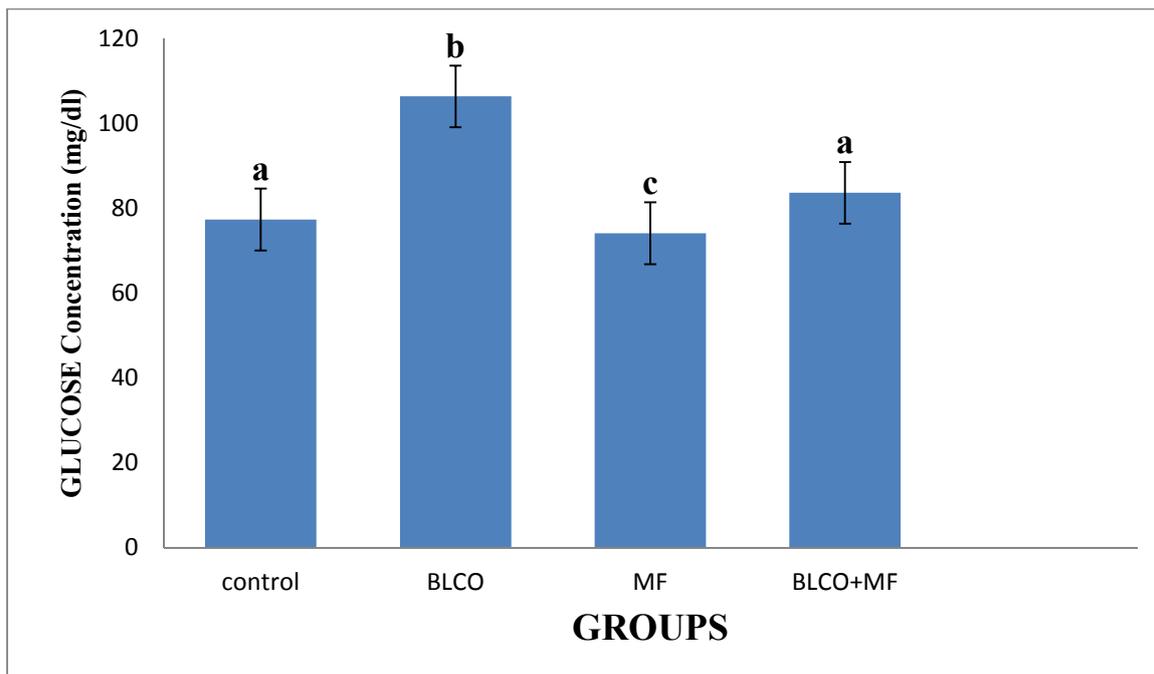


Figure 2. 1: Effect of oral administration of aqueous root extract of MF on serum glucose concentration of rats treated with BLCO. Values are expressed as mean \pm S.M.E (n=6). Means with different superscripts are significantly different at $p<0.05$ (Turkey hsd).

2.11.2 EFFECT OF MF ON MDA

Effect of aqueous root extract of MF on Lipid Peroxidation product (MDA) was shown on figure 2. Significant ($p<0.05$) increase in MDA was observed in BLCO treated group when compared to the control group. Administration of 170mg/kg body weight of aqueous root extract of MF (group 4) caused a significant ($p<0.05$) decrease in MDA compared to group 2. Also, group 3 showed a significant ($p<0.05$) reduction of MDA compared to control.

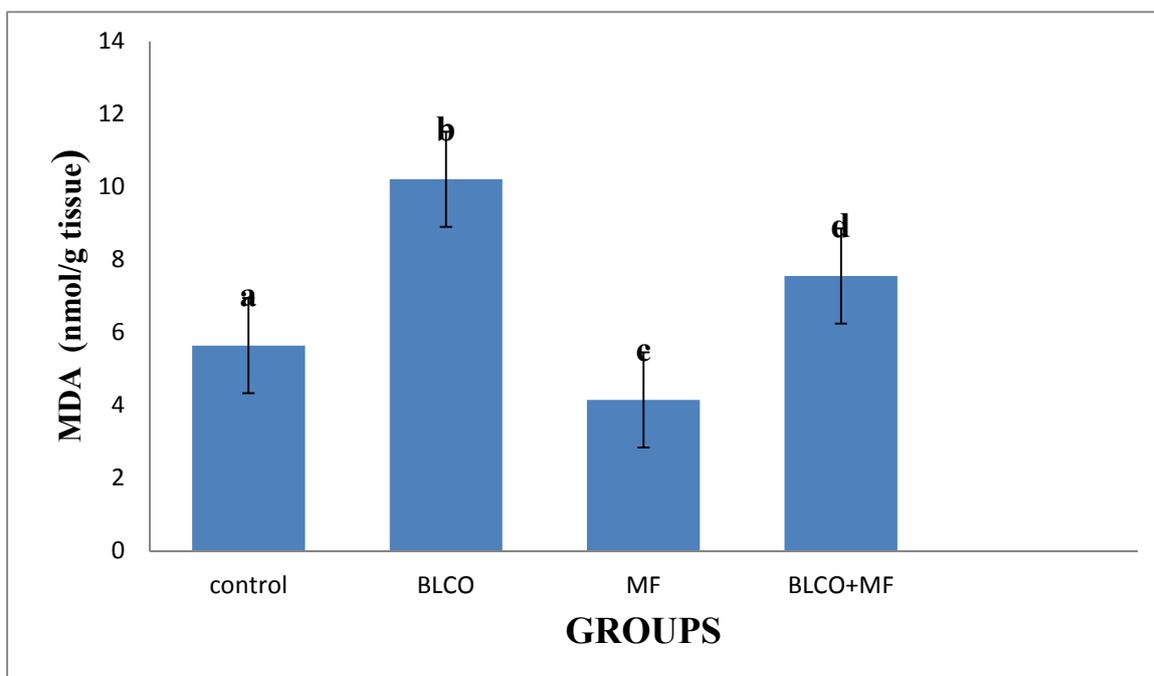


Figure 2. 2: Effect of oral administration of aqueous root extract of MF on MDA levels of rats treated with BLCO. Values are expressed as mean \pm S.M.E (n=6). Means with different superscripts are significantly different at $p<0.05$ (Turkey hsd).

2.12 DISCUSSIONS

Bonny light crude oil is classified as light crude oil due to the presence of fairly high aromatic hydrocarbons with relative solubility. A large proportion of this crude oil component is lipophilic in nature and has the ability to exert toxic effect in the cellular environment by competing with some endogenous metabolic pathways, cause enzyme inactivation and uncouple electrons forming complex products that damage lipid membranes, proteins, DNA and other macromolecules within the cell (Orisakwe *et al.*, 2004, Braide *et al.*, 2014,).

In this study, BLCO showed an increase level of serum glucose concentration indicating impairment in glucose homeostasis. Liberal availability of blood glucose cannot be utilized by cells for generation of ATP and subsequent release of insulin by pancreatic beta cells. Similar result was also obtained by (Oruambo and Dokubo, 2008). However, administration of aqueous root extract of *Manniphyton fulvum* significantly reduced the glucose levels directly or indirectly by enhancing oscillatory transport of glucose across membrane to allow calcium ion influx and concomitant secretion of insulin to extracellular fluid for mitochondria metabolism of glucose and generation of ATP. This could be considered a possible mechanism by which the aqueous roots extract of *Manniphyton fulvum* suppresses hyperglycemia.

Many environmental pollutants are known to cause oxidative stress in cells. The metabolism of these chemical substances facilitate the production of Reactive Oxygen Species (ROS) that can undergo a number chain reactions in lipid membranes, DNA and other macromolecules to cause cellular damage (Dokubo *et al.*, 2013). Oxidative Stress is a measure of lipid peroxidation often estimated as malondialdehyde (MDA), a product of lipid peroxidation.

From this study, rats administered with BLCO showed an elevated level of MDA suggesting increased oxidative stress (Ado *et al.*, 2012). This can lead to serious interrelated derangements in cell metabolism, regulation and alteration of intracellular calcium ion which culminates in cell damage (Oruambo and Jones, 2007). Decrease in the levels of MDA in rats treated with aqueous root extract of *Manniphyton fulvum* showed the possibility of the extracts to prevent oxidative stress, inhibit formation of lipid peroxidation products and deterioration of tissues and organs.

2.13 CONCLUSION

The essence of regulating many metabolic pathways is to provide a dynamic and constant environment for cells in the body to thrive. From this study, it can be deduced that the result obtained from this investigation agrees with other researches already carried out on crude oil toxicity. Improvement in glucose control by the aqueous root extract of *Manniphyton fulvum* ameliorated the development of hyperglycemia associated with BLCO toxicity. Also, inhibition or inactivation of complexes formed from Reactive Oxygen Species (ROS) offered a possible mechanism by which aqueous root extract of MF ameliorated oxidative damage caused by BLCO.

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