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Effect of Combined Aqueous Leaf Extract of *Mentha spicata* and *Murray Koenigii* on Acetaminophen (Paracetamol) Induced Hepatic Damage on Wistar Rats

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

The study investigated the effect of combined leaves extract of *Mentha spicata* and *Murray koenigii* leaves on acetaminophen induced hepatic damage on wistar rat. Twenty five (25) wistar rats with weights range of 100g-130g were used for this study. They were obtained from the animal house of the Department of Biochemistry, University of Port Harcourt, rivers State, Nigeria. They were kept in the animal house of the University. They had free access to water and feed during the period of the experiment. Treatment of test animal with 80mg/kg, 120mg/kg, 150mg/kg dose of the leaf extract showed ameliorative effect on the animals with specified dose producing the best result. The significant increase in liver marker enzymes (AST, ALP, and AST) activities of acetaminophen-induced rats caused by liver injuries which resulted in leakage of liver enzymes to the extra hepatic tissue due to compromised liver architecture and permeability. The improvement of the effect of the acetaminophen suggests that these combined leaves action can be of valuable use in the management of hepatic injury caused by this toxic action.

Keywords: Mentha spicata; Murray koenigii; *hepatic injury; toxic action; enzymes.*

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1. INTRODUCTION

Many antioxidants protect cells and tissues from the lipid peroxidation caused by free radicals. Herbs and spices are considered nutraceuticals since they play an important role in human nutrition. Herbs and spices are significant in human existence because they include a variety of antioxidant chemicals that have anti-cancer and anti-cardiovascular disease properties. Peppermint (Mentha piperita L.), a member of the Labiatae family, is an annual or perennial herbaceous plant with a height of 30 to 100 cm that is grown in temperate climes in America, Europe, and Asia [1]. Peppermint (Mentha piperita L.) is a natural cross between spearmint (Mentha aquatic L.) and water mint (Mentha aquatic L.) (*Mentha spicata* L). It's grown all over the world for usage as food flavouring and in various shampoos and soaps [2]. Mint is one of the most significant and widely used flavours in the world, second only to vanilla and citrus (Arslan et al., 2020).

Peppermint oil and several of its constituents have antibacterial and antioxidant qualities, and it is one of the most popular herbal tea ingredients. Peppermint essential oil is utilized in traditional medicine [3]. Peppermint contains substantial antibacterial and antiviral properties, as well as strong antioxidant and anticancer properties and some antiallergenic properties [4]. A number of volatile chemicals, primarily menthol, menthone, and isomenthone, as well as -carotene, chlorophyll, -and -gamma tocopherols, and ascorbic acid, have been found [5]. Plant pigment is a generic expression used to designate a large number of coloured molecules. Based on their chemical structure, they can be classified into 5 families, namely; i.e tetrapyrroles (e.g chlorophyll), caroteniods (e.g β-carotene), phenotic compounds, e.g teaflavin) and N-heterocyclic compounds (e.g betalins) [6].

Fresh tea leaves contain a significant amount of carotenoids, but their value is considerably reduced after processing, resulting in a variety of breakdown products [7]. In a study on green teas conducted in Japan, 38 distinct pigments were discovered, six of which were unknown [8]. Pheophytins a and b were the most prevalent pigments in these teas, followed by chlorophylls a and b and carotenoids such as -carotene and lutein in lower concentrations. In the order chlorophyll a > lutein > pheophytin a > chlorophyll b > -carotene > -carotene > pheophytin b, all of these pigments showed considerable antioxidant activity against hydrogen peroxide formation [9].

Carotenoids are a type of fat-soluble pigment found mostly in plants, algae, and photosynthetic bacteria, where they serve an important role in photosynthesis [10] and also protect chlorophyll from photooxidative destruction [11,12]. Scanty references exist on the elemental constituents of mints and curry leaves [13]. The objective of this study was to evaluate the combined effect of curry and mint leaves on acetaminophen toxicity of wistar albino rat, and to determine the hepatotoxicity of Acetaminophen (paracetamol).

2. MATERIALS AND METHODS

Fresh leaves of mint (*Mentha spicata*) and curry (*Murraya Keonigii*) were collected from Woji in Obio-Akpor Local Government Area of Rivers State, Nigeria and identified in the herbarium of the Department of Plant Science and Biotechnology in the University of port-Harcourt. The leaves were washed and air dried in the room temperature. The leaves were ground into fine powders to increase their surface area. 2.5g of mint leaf and 2.5g of curry leaf were dissolved in 50ml distilled water and shaken vigorously for five minutes, allow to stand for 10 minutes and then shaken for another five minutes and allowed to sand for 24 hours. This was filtered first with a piece of white cotton cloth for five times and then with the Whateman filter-paper. The filtrate served as stock from which dilutions of 80mg/kg, 120mg/kg and 150mg/kg were prepared and used for the treatment.

2.1 Experimental Animals

Twenty five wistar rats with weights of 100-130g used for this study were obtained from the animal house of the Department of Biochemistry, University of Port Harcourt, Nigeria. They were also kept in the animal house where they had free access to clean drinking water and feed. Variable factors such as light temperature and humidity were also put into account and maintained throughout the experiment.

2.2 Experimental Design

The 25 albino rats were randomly divided into five groups. Group 1 served as normal control and received only feed and water. Group 2 served as the negative control which was induced with paracetamol orally but was not treated with extract. Group 3-5 were induced with

acetaminophen and treated with different concentrations of the extract. This lasted for seven days.

2.3 Collection of Blood Sample

The group 1-5 animals were sacrificed after 7 days. They were anaesthetized in chloroform saturated chamber, and sacrificed. Fresh blood was extracted and placed in lithium heparin bottles. Liver samples were collected into sterile bottles for analysis.

2.4 Biochemical Assays

The determination of aspartate aminotransferase (AST) in the sample were performed at 37°C using the Colorimetric method using the randox kit by measuring the amount of oxaloacatete hydrazone formed in the presence of l-aspartate, d-oxoglutarate and 2,4-dinitrophenyl hydrazine as reported by [14]. For alanine amino tranferase (ALT), L-alanine replaced L-aspartate using the Colorimetric method. The determining of alkaline phosphatase activity used the diagnosticum kit and monitored the amount of inorganic phosphate releases from p-nitro Phenyl phosphate following the procedure of Thaussament [15]. The colorimetric method was used to determine triglycerdes (TRIGS) and cholesterol (total cholesterol) and HDL cholesterol.

2.5 Statistical Analysis

All data were expressed as mean ± SEM and statistically analyzed with the analysis of variance (ANOVA) at 95% confidence level. A P value of < 0.05 was considered statistically significant.

3. RUSULTS

Tables 1-6 below show the result. The value of ALT, cholesterol, Tricylglycerol, High Density lipoproteins (HDL), LDL and ALP showed increase in all the parameters above (122-30mmol/l). There was an uneven increase in Triglyceride, and the same was observed for HDL, LDL, and ALP.

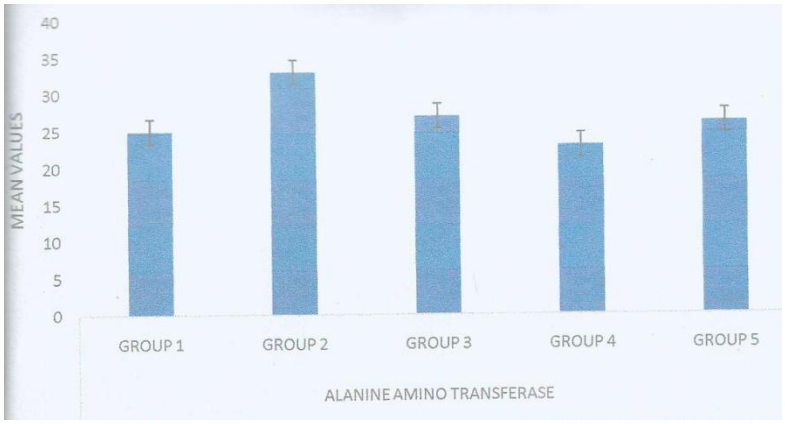

Table 1. Alanine Aminotranferase

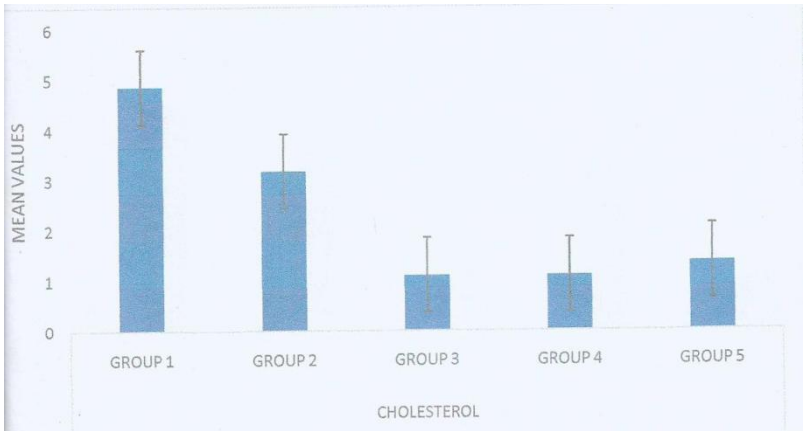

Table 2. Cholesterol

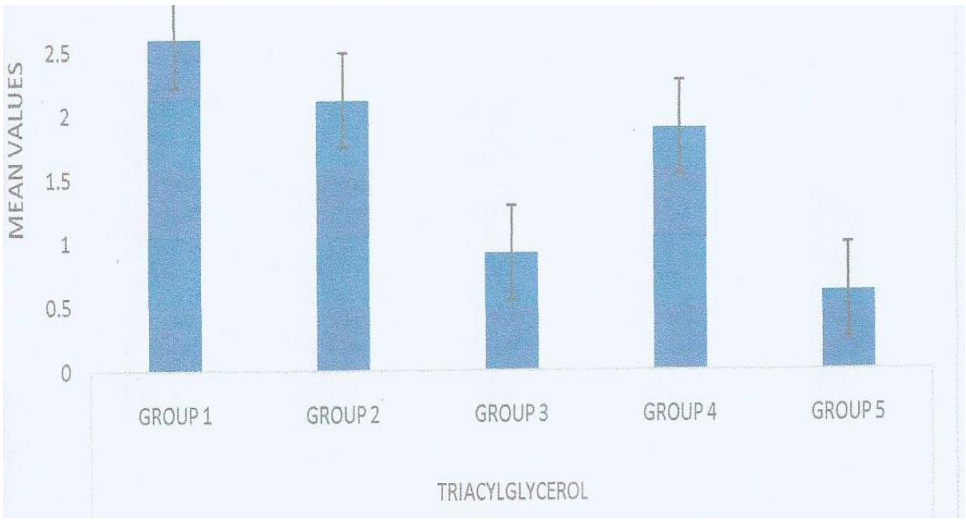

Table 3. Tricylglycerol

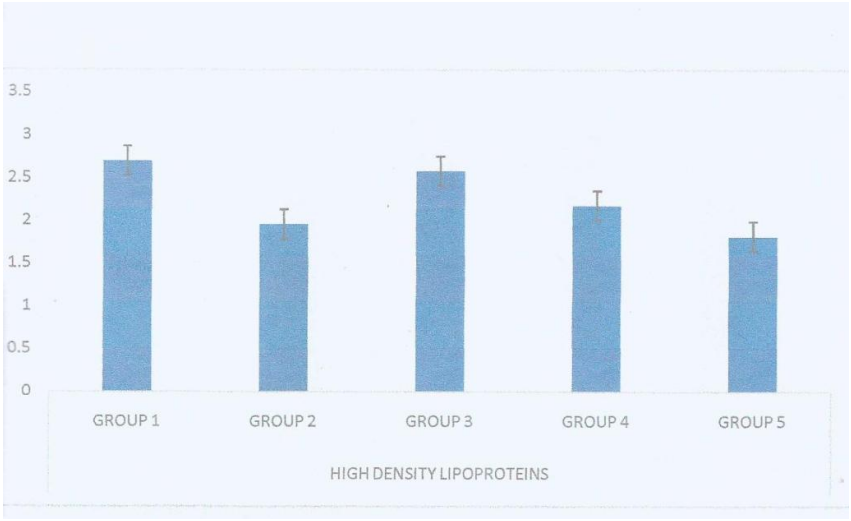

Table 4. High Density Lipoproteins

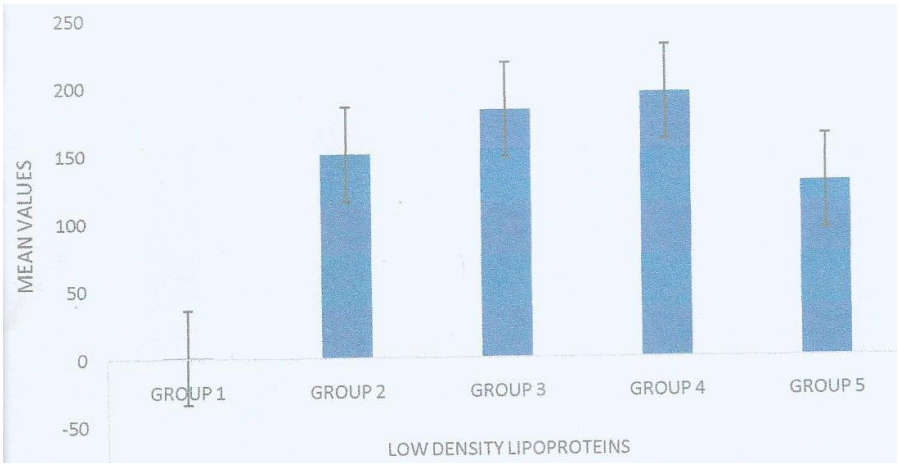

Table 5. Low Density Lipoproteins

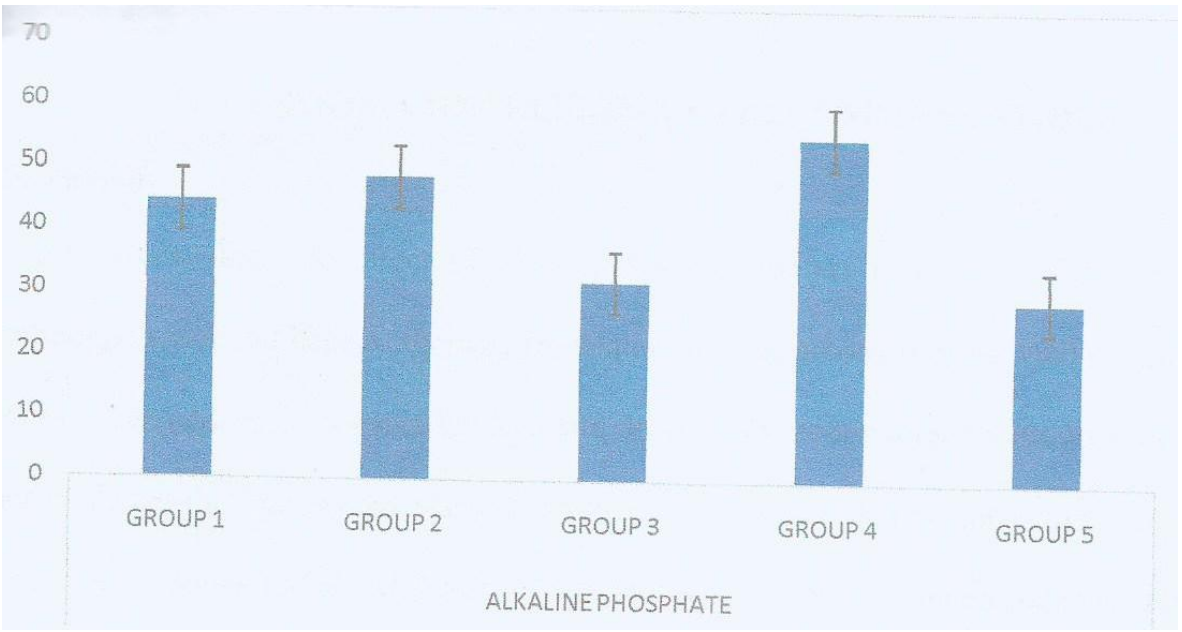

Table 6. Alkaline Phosphatase

4. DISCUSSION

The significant increase in liver marker enzymes (AST, ALP and AST) activities of acetaminophen-induced rats was caused by the leakage of liver enzymes to the extrahepatic tissue. The increased liver marker enzymes activities could be attributed to hepatic failures such as acute hepatic necrosis and destruction of hepatic cell membrane that compromise liver integrity and permeability [15].

The hepatic failure could have occurred from lipid peroxidation by reactive N-acetyl-p-benzoquinone-1-imine, which is produced from acetaminophen breakdown by cytochrome P450 enzymes. There was an increase in AST in the treated group when compared to negative group. The extract contained bioactive constituent that stimulated the continuous leakage of ALT [14].

The glucose concentration showed that there was a decrease in treated groups compared to group 2 showing hypoglycemic activity. The ALT concentration decreased in the groups 3 and 5 compared to group 2. Total cholesterol concentration decreased significantly ($p<0.05$) in the treated group compared to group 2. Triacylglycerol (TAG) significantly decreased ($p<0.05$), in groups 3 and 5 when compared to group 2. There was no significant decrease in group 4 rats. Good cholesterol, the result HDL, showed positive result for group 5 rats ($p<0.05$). The result suggested that the extract has antilipidemic activity. There was also a decrease in LDL for group 5 rats [14].

5. CONCLUSION

In conclusion, the study showed that the combined action of the extracts posses hepatoprotective effect on acetaminophen – induced wistar rats.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors

ETHICAL APPROVAL

Animal Ethic committee approval has been taken to carry out this study

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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