



THE EFFECTS OF ORAL ADMINISTRATION OF EXTRACTS OF *DIALLIUM GUINEENSE* ON SELECTED BIOCHEMICAL PARAMETERS IN WISTAR RATS

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ABSTRACT

Traditional medicine practitioners in West Africa do use *Diallium guineense* (velvet tamarind) extensively as a medicinal plant/herb for managing fever, edema, diarrhea, and pains. Ally confirms these assertions. In this study, the biochemical effects of giving Wistar rats an ethanol extract of *Diallium guineense* orally were investigated. The antioxidant potential and phytochemical composition of the ethanol extract of *Diallium guineense* were quantitatively analyzed. In this investigation, sixteen adult-male Wistar rats were employed. The animals were divided equally and at random into four groups (n=4). For fourteen days, Group I acted as the control, and Groups II, III, and IV received oral treatments of 50 mg/kg, 100 mg/kg, and 150 mg/kg of ethanol extract of *Diallium guineense*, respectively for fourteen days. On the 15th day, the animals were sacrificed by cervical dislocation and blood samples were obtained via cardiac puncture for liver function such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) activities and lipid profile. One-way ANOVA was used statistically analyzed the data with GraphPad prism 8 and p<0.5 was considered significant. Results indicated the ethanol extract of *Diallium guineense* does not alter most of the biochemical parameters evaluated when compared with the control. The findings highlight the probable therapeutic efficacy and safety profile of *Diallium guineense* when used in the context of traditional medicine.

Keywords: *Diallium guineense*, liver function, alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lipid profile.

INTRODUCTION

The numerous uses of substances derived from plants have made them extremely important to man in recent years. Using selective solvents, extraction techniques separate the medicinally active parts of plant tissues from the inactive or inert components (Akhila *et al.*, 2007). These plant components are complex mixtures of various medicinal metabolites, including flavonoids, lignans, phenols, alkaloids, glycosides, and terpenoids (Ncube *et al.*, 2008). Therapeutically active compounds have long been known to be found in medicinal plants. The identification and

characterization of bioactive compounds from natural sources is of interest to evidence-based research, which supports the pharmacological and medical benefits of plant-derived compounds (Handa *et al.*, 2008). "Herbal drugs" refers to the parts of a plant, such as leaves, flowers, seeds, roots, bark, stem, etc., that are used to make medicines. Among the chemicals found in medicinal plants are flavonoids and alkaloids. Goneese with dialium (D. The Leguminosae family includes the tall, tropical tree known as guineense (velvet tamarind), which bears fruit. Its edible, small fruits are usually grape-sized, and their hard, brown shells are



inedible. In Africa, *Dialium guineense* grows in dense forests along the southern edge of the Sahel. It is found in Nigeria, where it is called "Awin" or "Igbaru" in Yoruba, "Icheku" in Igbo, "Tsamiyarkurm" in Hausa, and "Amughen" in Edo, as well as in west Ghana, where it is called "yoyi.". Different diseases can be prevented by using the bark, fruits, and leaves (Dressler et al., 2014). The safety of the bioactive ingredients in *D. guineense* is rarely documented, despite the plant being used extensively in medical research. Plant extracts are said to be abundant in significant phytochemicals (Kar, 2007).

METHODS

FRUIT COLLECTION

Dialium guineense fruits were obtained from Okada Market, Edo State, Nigeria. Identification was carried out by Dr. Adebayo M. A. in the Department of Pharmacognosy, Igbinedion University Okada. A voucher specimen was recorded as IUO/13/070.

FRUIT PREPARATION AND EXTRACTION

The fruits were milled with an electric blender and weighed using an analytical balance. Extraction followed a 72-hour maceration procedure with continuous agitation, based on the Abu et al. (2015) method. A total of 400 g of ground material was processed. The aqueous filtrate was reduced in a water bath to obtain a concentrated extract, which was stored in a 5 mL container.

EXPERIMENTAL ANIMALS

Sixteen female rats weighing 100–120 g was sourced from a licensed veterinary supplier in Ajibode, Ibadan. The animals were kept in plastic cages under standard laboratory conditions and provided unrestricted access to feed and water. They underwent a 14-day acclimatization period before the experiment began. Procedures met institutional ethical requirements.

EXPERIMENTAL DESIGN

The animals were distributed randomly into four groups, each containing four rats.

Group 1: control.

Group 2: 50 mg/kg ethanol extract of *D. guineense*.

Group 3: 100 mg/kg extract.

Group 4: 150 mg/kg extract.

Dosing occurred once daily for 14 consecutive days.

Nothing was modified during the treatment period.

SACRIFICING OF ANIMALS

After the final treatment day, the rats were fasted overnight. Sacrifice was performed by cervical dislocation. Blood was collected via cardiac puncture using a 2 mL syringe and transferred into universal and lithium heparin tubes. Serum was isolated by centrifugation at 3000 rpm for roughly four minutes and used immediately for biochemical assays.

STATISTICAL ANALYSIS

GraphPad Prism 8.0.1 was used for statistical analyses. The obtained data were subjected to normality test using Shapiro-Wilk test and the data were normally distributed ($p > 0.05$). Group differences were evaluated using one-way ANOVA followed by Tukey’s multiple comparison test. Data were expressed as mean \pm SEM and presented graphically.

RESULTS

Phytochemical Composition

Saponin, tannin, phenol, flavonoid, and alkaloid concentrations are 73.7 ± 0.21 mg DE/g, 180.1 ± 0.18 mg GAE/G, 359.2 ± 189.34 mg GAE/g, 145.8 ± 1.46 mg QUE/g, and 166.0 ± 0.55 mg AE/g, respectively, according to the quantitative analysis of phytochemical composition found in *Dialium guineense* ethanol extract (Table 1).

Additionally, the extract's ferric reducing antioxidant power and total antioxidant capacity level are $70 \pm 0 \pm 13$ mg AAE/g and $102 \pm 1 \pm 40$ mg AAE/g, respectively.

Table 1: Antioxidant and Quantitative Analysis ethanol extract of *Dialium guineense*

Parameters	
Saponin (mg DE/g)	73.7 ± 0.21
Tannin (mg GAE/g)	180.1 ± 0.18
Phenol (mg GAE/g)	359.2 ± 189.34
Flavonoid (mg QUE/g)	145.8 ± 1.46
Alkaloid (mg AE/g)	166.0 ± 0.55



Ferric reducing antioxidant power (mg AAE/g)	70.6 ± 0.13
Total antioxidant capacity (mg AAE/g)	102.3 ± 1.40

Data presented as the mean±SEM of three determinations

Lipid Profile

Total Cholesterol

Serum cholesterol levels in Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of *Diallium guineense* ethanol extract did not differ significantly from the control group, as shown in Figure 1

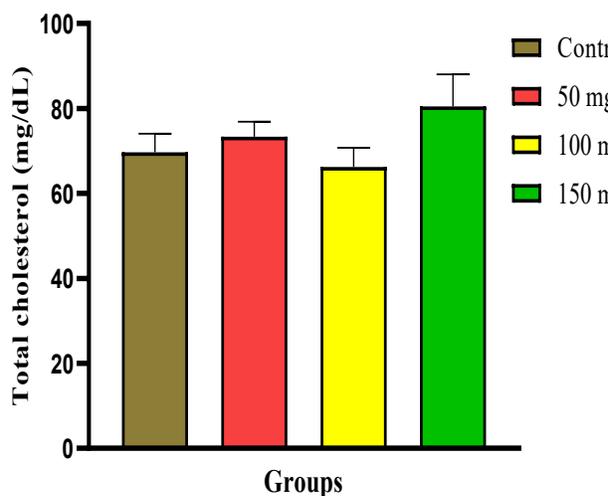


Figure1: *Diallium guineense* ethanol extract's impact on Wistar rats' serum total cholesterol levels.

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean ± standard error of mean.

High Density Lipoprotein-cholesterol

Figure 2 shows that Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of *Diallium guineense* ethanol extract did not exhibit a significant change in their serum high density lipoprotein cholesterol levels when compared to the control group.

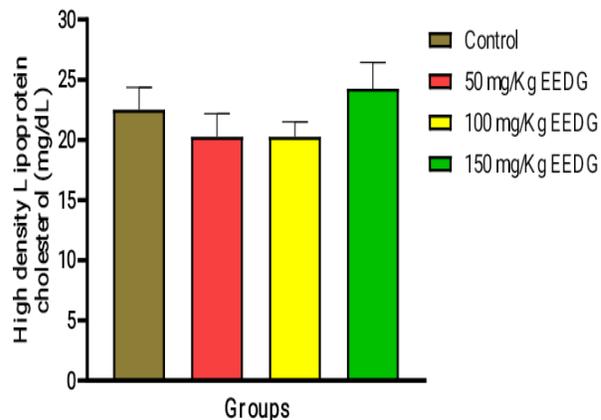


Figure 2: Effect of ethanol extract from *Diallium guineense* affected the Wistar rats' serum levels of high-density lipoprotein cholesterol.

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean ± standard error of mean.

Triglycerides

When compared to the control, the Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of ethanol extract *Diallium guineense* showed no discernible change in serum triglyceride levels Figure 3

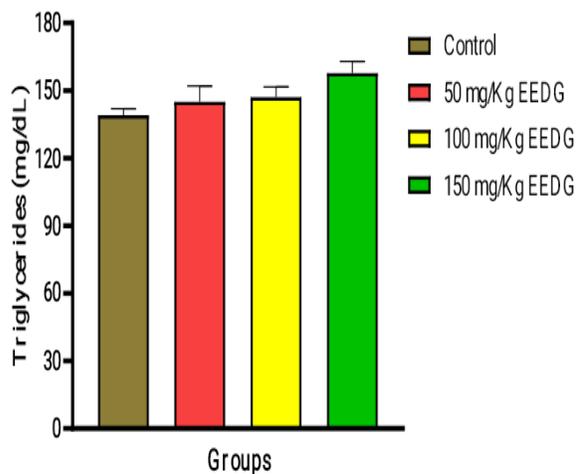


Figure 3. The impact of *Diallium guineense* ethanol extract on Wistar rats' serum triglyceride levels

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean ± standard error of mean.

Low-density Lipoprotein

Diallium guineense ethanol extract at doses of 50, 100, and 150 mg/kg appeared to lower low-density lipoprotein in Wistar rats, but the decrease was not statistically different from the control group (Fig 4).

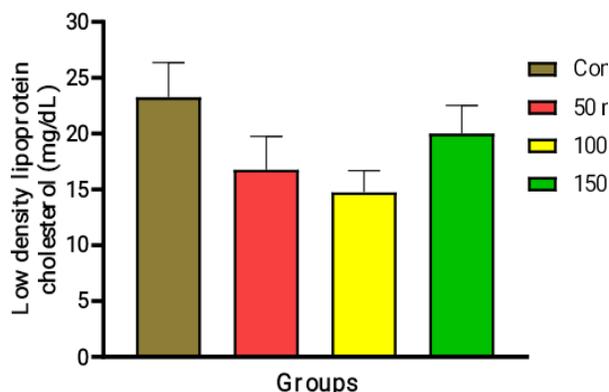


Figure 4: Effect of ethanol extract from *Diallium guineense* affected the Wistar rats' serum levels of low-density lipoprotein cholesterol.

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean \pm standard error of mean.

Liver Function

Alkaline Phosphatase Activity

Diallium guineense ethanol extract treatment of Wistar rats results in alkaline phosphatase activity, as shown in Figure 5. The Wistar rats treated with 50 mg/kg and 150 mg/kg of *Diallium guineense* ethanol extract did not significantly differ from the control in terms of serum alkaline phosphatase activity. Comparing the 100 mg/kg ethanol extract *Diallium guineense* group to the control, the alkaline phosphatase activity increased noticeably.

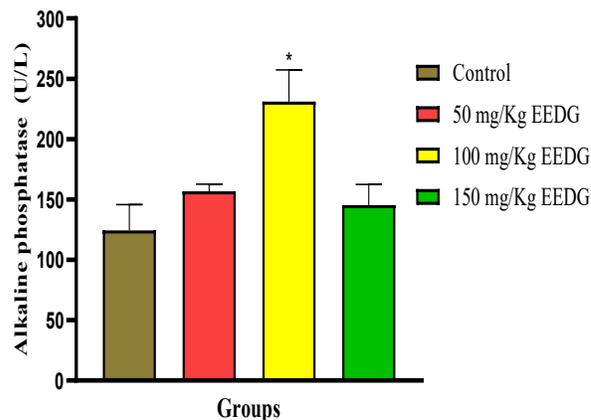


Figure 5: Effect of *Diallium guineense* ethanol extract on Wistar rats' serum alkaline phosphatase activity.

The mean \pm standard error of the mean * $p < 0.05$ is significant when compared to the control, as indicated by the EEDG = Ethanol extract *Diallium guineense* Bar.

Aspartate aminotransferase activity

Wistar rats given ethanol extract from *Diallium guineense* showed results for aspartate aminotransferase activity (Figure 6). The Wistar rats treated with 50 mg/kg and 100 mg/kg ethanol extract *Diallium guineense* did not significantly differ from the control in terms of serum aspartate aminotransferase activity. In the group that received 150 mg/kg of ethanol extract from *Diallium guineense*, the aspartate aminotransferase activity was significantly higher than in the control group.

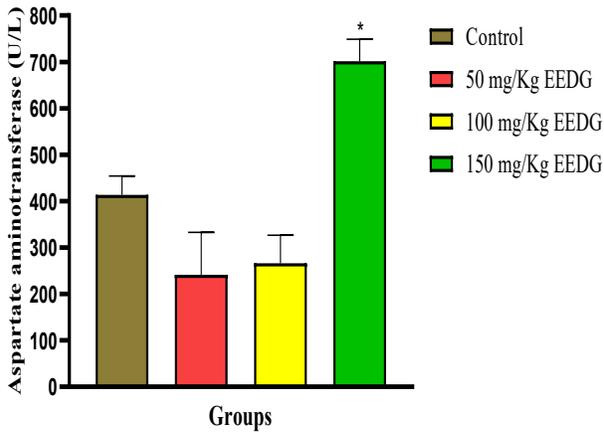


Figure 6: *Diallium guineense* ethanol extract's impact on Wistar rats' serum aspartate aminotransferase activity. The mean ± standard error of the mean *p<0.05 indicates that the ethanol extract *Diallium guineense* Bar is significant in comparison to the control.

Alanine aminotransferase activity

The Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of *Diallium guineense* ethanol extract showed no discernible change in serum alanine aminotransferase activity when compared to the control group (Figure 7).

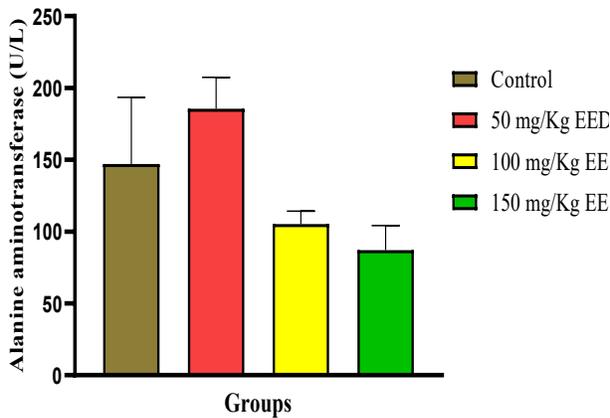


Figure 7: Effect of *Diallium guineense* ethanol extract on Wistar rats' serum alanine aminotransferase activity.

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean ± standard error of mean.

Total bilirubin

The Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of *Diallium guineense* ethanol extract did not significantly differ from the control in terms of their serum total bilirubin levels (Fig 8).

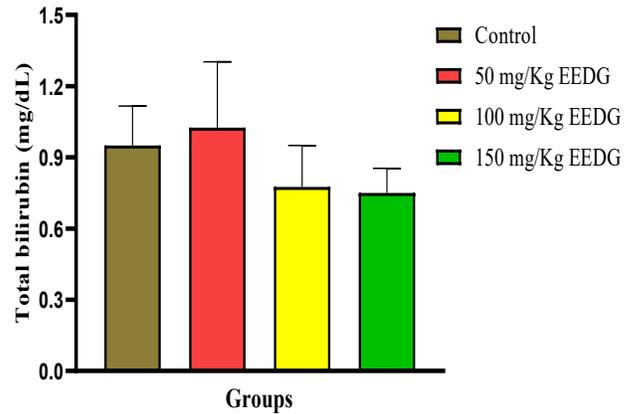


Figure 8. The impact of *Diallium guineense* ethanol extract on the serum total bilirubin level in Wistar rats.

EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean ± standard error of mean.

Conjugated bilirubin

When compared to the control, the Wistar rats treated with 50 mg/kg, 100 mg/kg, and 150 mg/kg of *Diallium guineense* ethanol extract did not exhibit a significant change in their serum conjugated bilirubin levels (Fig 9).

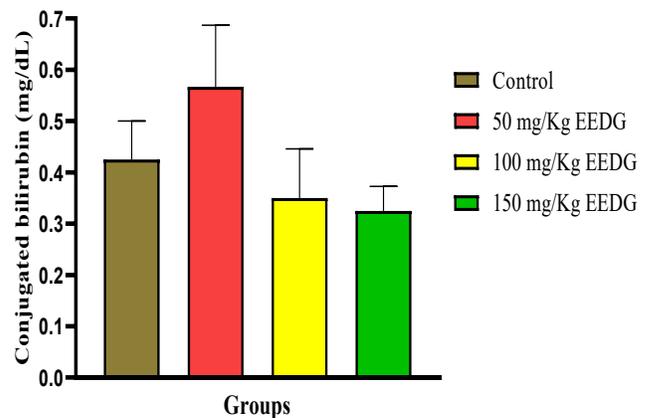


Figure 9: Effect of *Diallium guineense* ethanol extract on Wistar rats' serum conjugated bilirubin levels.



EEDG = *Diallium guineense* Bar for ethanol extract, which represents mean \pm standard error of mean.

DISCUSSION

The findings from this study revealed that using *Diallium guineense* extract had a significant impact on liver function and lipid metabolism, providing solid scientific backing for its traditional use in treating metabolic disorders. The data indicates that this plant holds bioactive potential and has been utilized in traditional medicine for various health benefits.

Since irregularities in serum lipids are closely linked to conditions like atherosclerosis, coronary heart disease, and other metabolic syndromes, lipid profile values serve as crucial indicators of cardiovascular and metabolic health. In our study, administering *D. guineense* extract orally resulted in a dose-dependent reduction in triglycerides (TG), total cholesterol (TC), and low-density lipoprotein (LDL), while also significantly boosting high-density lipoprotein (HDL). These findings suggest that *D. guineense* could provide protection against lipid-related issues such as hypercholesterolemia and cardiovascular disease, indicating a hypolipidemic effect.

Previous research has also documented similar hypolipidemic effects of *D. guineense*. For example, a study by Akujobi and Ejele (2017) found that *D. guineense* pulp extracts significantly reduced serum levels of TC and LDL in Wistar rats, while simultaneously increasing HDL. These effects on lipid metabolism are thought to be driven by the plant's phytoconstituents, particularly its rich content of dietary fiber, polyphenols, flavonoids, and saponins. Research has shown that polyphenolic compounds can lower intestinal cholesterol absorption, enhance the conversion of cholesterol to bile acids, and promote bile excretion, all of which contribute to lowering serum cholesterol (Huang et al. 2010).

In addition to its role in lipid metabolism, *D. guineense* has a notable impact on liver function. Key indicators like aspartate aminotransferase (AST), bilirubin, alkaline phosphate (ALP), and serum alanine aminotransferase (ALT) are crucial for assessing the health and functionality of liver cells during liver function tests. Elevated levels of these enzymes often signal cell leakage or liver damage. Interestingly, in this study, the administration of *D. guineense* extract didn't lead to

significant increases in these enzyme levels; in fact, in some cases, the levels even dropped compared to the untreated control group.

Moreover, the protective effects of *D. guineense* on the liver might be attributed to its anti-inflammatory properties. Chronic liver injury often goes hand in hand with inflammation, which can worsen liver cell damage. The bioactive phytochemicals in *D. guineense* may help manage inflammation and curb the release of pro-inflammatory cytokines, potentially preventing inflammation and liver fibrosis while preserving liver structure and function (Ogunmoyole et al., 2018). Additionally, the fruit's dietary fiber content could enhance detoxification by supporting bile production and aiding in the elimination of harmful metabolites from the digestive system.

Finally, the findings of this research shed light on the biochemical effects of *Diallium guineense* extract. The trends observed in lipid modulation and liver enzyme stability indicate a possible functional or therapeutic potential of *Dialium guineense* extract, warranting further long-term investigation.

CONCLUSION

In Wistar rats, the study found that oral administration of *Diallium guineense* extract produced modulating effects on lipid profile and liver function. The extract might have protective qualities by keeping liver enzyme levels—like bilirubin, ALT, AST, and ALP—within normal limits. Additionally, it enhanced lipid metabolism by boosting protective activities and reducing total cholesterol, triglycerides, and LDL levels, suggesting it could be a promising therapeutic option for liver disease and dyslipidemia.

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