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# Cardioprotective Potentials of *Persea americana* (Lauraceae) Leaf Aqueous Extract in a Rat Model of Isoprenaline-Induced Myocardial Infarction

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## Abstract

**Introduction:** Worldwide, 32% of deaths are due to cardiovascular diseases, including myocardial infarction (MI). *Persea americana* (Lauraceae) is a plant traditionally used in Cameroon against arterial hypertension and diabetes. This study aimed at investigating the cardioprotective properties of *Persea americana* (*P. americana*) leaf aqueous extract on two cardiac biomarkers and the myocardium architecture in a rat model of isoprenaline (ISO)-induced MI.
**Methods:** Thirty (30) adult *Wistar* rats were randomly distributed into six (6) groups of five (5), and then treated for twenty-eight (28) days. There were three control groups: neutral control (water 10 mL/kg; 28 days), negative control (ISO 150 mg/kg; day 27 and 28) and positive control (propranolol 10 mg/kg; day 19 -28 + ISO 150 mg/kg; day 27 and 28). Three test groups received *P. americana* extract (50, 100 or 200 mg/kg, respectively) for 28days, and ISO (150 mg/kg) 2 days prior to sacrifice. Myocardial infarction was induced in the rats using subcutaneous injection of 150 mg/kg/day Isoprenaline (ISO) for two consecutive days (27th and 28th) at 24 hours interval. Food and water consumption and body weight were recorded during this period of treatment. Recordings and treatments were done at 10 am every day. Rats were sacrificed on day 29 at 10 am and blood was collected for analysis. Heart weight was measured. Serum levels of Creatine kinase-MB and Troponin I were determined. A histopathological study of the cardiac tissues was done. ANOVA, followed by a multiple comparison turkey test was used for statistical analyses.

$P < 0.05$ was the limit of significance. **Results:** Troponin level was 14.49 ± 2.58 μg/L in the neutral control group. ISO significantly ($P < 0.05$) increased troponin level in the negative control (54.96 ± 3.36 vs. neutral control). Treatment with *P. americana* extract (50, 100, and 200 mg/kg) dose-dependently and significantly ($P < 0.05$) decreased the concentration of troponin to 39.97 ± 1.27, 31.69 ± 1.75 and 29.41 ± 0.01 μg/L (vs. negative control), respectively. Propranolol, in the positive control, decreased troponin level to 21.23 ± 1.39 μg/L. ISO also caused an increase in Creatine-kinase-MB from 17.88 μg/L (neutral control) to 61.28 ± 5.08 μg/L (negative control). *P. americana* extract (50, 100, or 200 mg/kg) dose-dependently and significantly ($P < 0.05$) decreased the levels of Creatine-kinase-MB to 54.39 ± 3.10, 42.18 ± 2.62, or 35.50 ± 3.73 μg/L in test groups, respectively. Propranolol reduced the Creatine-kinase-MB to 21.03 ± 1.00 μg/L in the positive control. In the heart histology, there was necrosis, distorted cell structures, or/and formation of massive vacuoles, especially in the negative control and less observable in the positive control and treatment groups. There were also changes in sub-epicardial myocardium in the negative control. These damages were greater in the negative control compared to the positive control, and much less observable in the test groups. **Conclusion:** *Persea americana* aqueous extract is cardioprotective against ISO-induced MI and can be used to prevent cardiac arrests.

## Keywords

*Persea americana*, Myocardial Infarction, Isoprenaline, Rat, Troponin, CK-MB

## 1. Background

Cardiovascular diseases are the leading cause of most casualties in the world, leading to more than five million deaths each year in Africa [1]. Coronary artery disease (CAD) is the leading cause of death, with acute myocardial infarction (AMI) accounting for most of the deaths related to CAD [2]. Changes in human lifestyle and behaviour, particularly in developing countries, have led to a continuous rapid increase in acute MI incidence over recent decades, with annual growth rates of more than 3.5% [2] [3]. About 10% of patients who present to emergency departments with chest pain every year are diagnosed with acute MI [4]. Among these cardiovascular diseases, hypertension is the most prevalent. It occurs as a result of a combination of genetics, age, and inappropriate diet and lifestyle choices and in some cases medical conditions and pregnancy in women [5] [6]. Globally, hypertension affected 648 million people aged 30 - 79 years in 1990 and increased to 1.28 billion by 2019, suggesting that approximately one-third of adults have hypertension [7] [8]. If current trends continue, the global burden is projected to reach ~1.5 billion people by 2030 and 2.0 billion people by 2050 [9]. Among women and men with hypertension in 2019 worldwide, 41% and 51% were estimated to be undiagnosed, 12% and 11% were diagnosed but untreated, and 24% and 20% were

treated but uncontrolled, resulting in blood pressure control rates of only 23% and 18%, respectively [10]. Studies revealed that hypertension is the most common risk factor of cardiovascular diseases, including myocardial infarction [11]. In 2003, cardiovascular disease prevalences of 25.6% and 23.1% were reported, respectively, in male and female individuals from a Cameroonian urban area [12]. Given the high cost of cardiovascular disease treatments, in "conventional medicine", most African communities are mainly focused on traditional plant-based treatment [13]. Nearly 75% - 80% of the world population uses plants to heal [14]. Most concerned are economically developing countries [15] like Cameroon.

*Persea americana* Mill (Lauraceae) is increasingly used in the management of hypertension [16]. It is widely known as the avocado pear tree and is mostly distributed in tropical countries [17]. The edible fruit pulp contains up to 33% oil rich in monounsaturated fatty acids [18], which are known to modify the fatty acid contents in cardiac and renal membranes and enhance the absorption of alpha/beta-carotene and lutein [19]. The carotenoid content may play a significant role in cancer risk reduction, wound healing and hepatoprotective properties have been ascribed to the whole oil or its fatty acid constituent [20] [21]. Proximate analysis has been conducted on the seeds [22]. Other parts of the plant have been reported to have medicinal properties. The aqueous leaf extract, for example, has shown analgesic and anti-inflammatory [23], anticonvulsant [24], hypoglycaemic and hypocholesterolaemic [25], vasorelaxant and blood pressure reducing [26] activities in animal studies. The leaf extract is used to treat hypertension and induce diuresis in Brazilian ethnomedicine [27]. In Nigeria, the aqueous bark extract of the tree is used by traditional medicine practitioners for the treatment of parasitic skin diseases [28]. While studies on the antihypertensive properties of the plant have focused mostly on the seed extracts, there is no sufficient report on the use of the leaf extract for the management of hypertension and other cardiovascular diseases, especially in Isoprenaline induced myocardial infarction model [29] [16]. However, herbalists in Nigeria have confirmed through oral communication that the leaf extract is effective in the treatment of hypertension [29] [30], the major risk factor of MI. This study was undertaken to investigate the cardioprotective properties of *Persea americana* [Lauraceae] leaf aqueous extract on two cardiac biomarkers (Troponin I/T and Creatine-kinase-MB (CK-MB)) and the heart architecture in a rat model of isoprenaline-induced myocardial infarction.

## 2. Materials and Methods

### 2.1. Animals Handling and Ethical Consideration

This study was performed on adult *Wistar* rats of both sexes with an average age of 4 - 6 weeks, weighing between 100 and 120 g. Animals were purchased and acclimatized in the animal house of the Faculty of Science (University of Buea, Cameroon) for 7 days. The rats were housed in wire-bottomed cages under natural environmental conditions. The animals were given food and water ad-libitum. All animals were strictly handled according to guidelines for the care and use of

laboratory animals. An authorization (UB-IACUC N˚ 25/2025) was obtained from the University of Buea Institutional Animal Care and Use Committee. The animals were given food and water *ad-libitum*.

## 2.2. Plant Leaves and Phytochemical Extraction

Fresh *Persea americana* (*P. americana*) leaves were collected from Buea, washed properly with tap water and shed dried. The shed-dried leaves were ground using an electric blender; the powder obtained was then kept at 4˚C in a sealed plastic packet until experiment, to avoid microbial contamination. Briefly, plant powder (1000 g) was macerated at room temperature in 5 L of water for 48 h (with occasional stirring), followed by filtration using Whatman filter paper N˚ 1. The residues were macerated again in the correspondent solvent for 48 h followed by filtration. The filtrates obtained were pooled, concentrated in an oven at 45˚C to yield the aqueous extract.

## 2.3. Distribution and Treatment of Rats

Thirty (30) adult *Wistar* rats were randomly distributed into six (6) groups of five (5), and then treated for twenty-eight (28) days. Groups 1-3 were the three controls: neutral (receiving water 10 mL/kg, *per os* daily), negative (receiving ISO 150 mg/kg, *sc*, 2 days to sacrifice) and positive (receiving ISO 150mg/kg, *sc*, 2 days to sacrifice + propranolol 10 mg/kg, *per os*, 10 days to sacrifice) respectively. Test groups (4 - 6) received *per os Persea americana* leaf aqueous extract at 50, 100 or 200 mg/kg respectively, daily during the experimental period and ISO (150 mg/kg, *sc*) 2 days to sacrifice (Table 1) Myocardial infarction was induced in the rats using subcutaneous injection of 150 mg/kg/day Isoprenaline (ISO) for two consecutive days (27th and 28th) at 24 hours interval [30].

**Table 1.** Animal distribution and treatment.

| Groups | Treatments administered | Duration |
|---|---|---|
| **Group 1 neutral control** | Distilled water only (10 mL/kg/day) | 28 days |
| **Group 2 negative control** | ISO (150 mg/kg/day) | 2 days before sacrifice (days 27 and 28). |
| **Group 3 positive control** | Propranolol (10 mg/kg/day) and ISO (150 mg/kg/day) | Propranolol for 10 days to the sacrifice (day 19 - 28) and ISO for 2 days before sacrifice (days 27 and 28). |
| **Group 4 test group 1** | 50 mg of extract of *Persea americana* + ISO (150 mg/kg/day) | *Persea americana* extracts for 28 days, ISO for 2 days before sacrifice (days 27 and 28). |
| **Group 5 test group 2** | 100 mg of extract of *Persea americana* + ISO (150 mg/kg/day) | *Persea americana* extracts for 28 days, ISO for 2 days before sacrifice (days 27 and 28). |
| **Group 6 test group 3** | 200 mg of extract of *Persea americana* + ISO (150 mg/kg/day) | *Persea americana* extracts for 28 days, ISO for 2 days before sacrifice (days 27 and 28). |

Note: ISO: Isoprenaline.

### 2.4. Determination of Body Weight, Food and Water Consumption

Food and water consumption, and body weight were recorded during the period of treatment. Specific quantities of feed and water were given to each group daily and their consumptions were determined by subtracting the left-overs from the originally given quantities. Average food and water consumptions were calculated weekly. Furthermore, the relative weight of the heart was calculated following the formula:

$$RHW = HW \div BWAS \times 100$$

**where:**

HW = Heart Weight;

BWAS = Body Weight at Sacrifice;

RHW = Relative Heart Weight.

### 2.5. Biochemical and Histological Analyses

Rats were sacrificed on day 29. Blood (4 mL) was collected by cardiac puncture with a syringe, put in dry tube and allowed to rest for 5 mins. Thereafter, blood was centrifuged at 3000 revolutions per min (−5˚C) for 10 minutes, then the serum collected and stored at −28˚C in the freezer, for further analyses. Serum levels of creatine-kinase (CK-MB) and troponin I were assayed using ELISA kits following the instructions of the manufacturer.

The heart was also collected, cleaned, and the weight recorded. It was then preserved in 4% formalin for two weeks and then carried to the laboratory of Animal Physiology of the University of Yaounde I for histopathological examinations. The tissues were removed from the fixatives, dehydrated, included in paraffin and sections of 2 µm thick were made using a microtome. Tissue sections were further mounted on glass slides, rehydrated, stained with Haematoxylin and Eosin stain (HE) [31] and finally examined under a light microscope (×200). Micrographs were snapped with the aid of a digital camera attached to the eyepiece of the microscope.

Statistical evaluation: Data were recorded in MS Excel and analyzed using GraphPad Prism (version 8.3). Results are presented as tables and graphs, with values expressed as the mean, ±SEM. Data were evaluated using a one-way ANOVA followed by a Tukey's multiple comparisons test, with statistical significance set at $P < 0.05$.

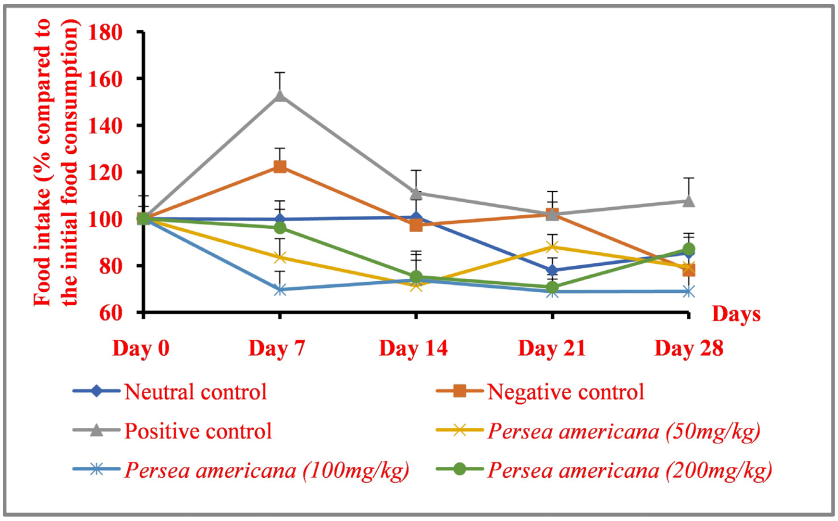
## 3. Results

### 3.1. Effects of *Persea americana* Leaf Aqueous Extract on Water and Food Consumption and on the Body Weight of Rats

#### 3.1.1. Effects of *Persea americana* Leaf Aqueous Extract on Food Intake

During 28 days administration of rats with *P. americana* (50 - 200 mg/kg), ISO (150 mg/kg), and propranolol (10 mg/kg), there was a haphazard change in the quantity of food consumed by the rats in all groups from day 0 to 28. However, the mean food consumption did not vary among the neutral control, and *P. amer-*

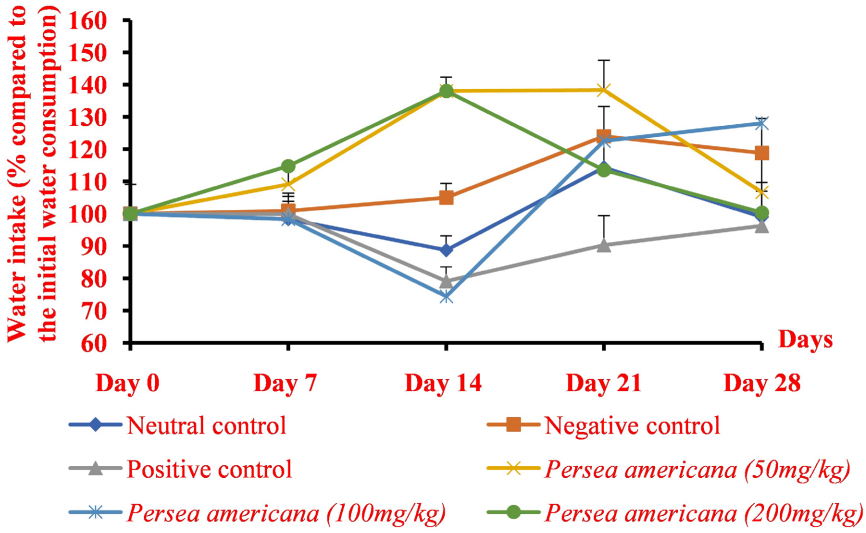
*icana* groups treated. From day 21 - 28, food consumption was 632.8 ± 44.79 g in the negative control group against 754.6 ±58.42, 666.92 ± 72.36, or 812.6 ± 61.23 g in animals treated with *P. americana* leaf aqueous extract respectively at 50, 100, or 200 mg/kg (Figure 1).




Note: Each point on the line represents the mean, ±SEM, n = 5.

**Figure 1.** Effects of Persea americana leaf aqueous extract on food consumption of treated rats.

### 3.1.2. Effects of *Persea americana* Leaf Aqueous Extract on Water Consumption




Note: Each point on the line represents the mean, ±SEM, n = 5.

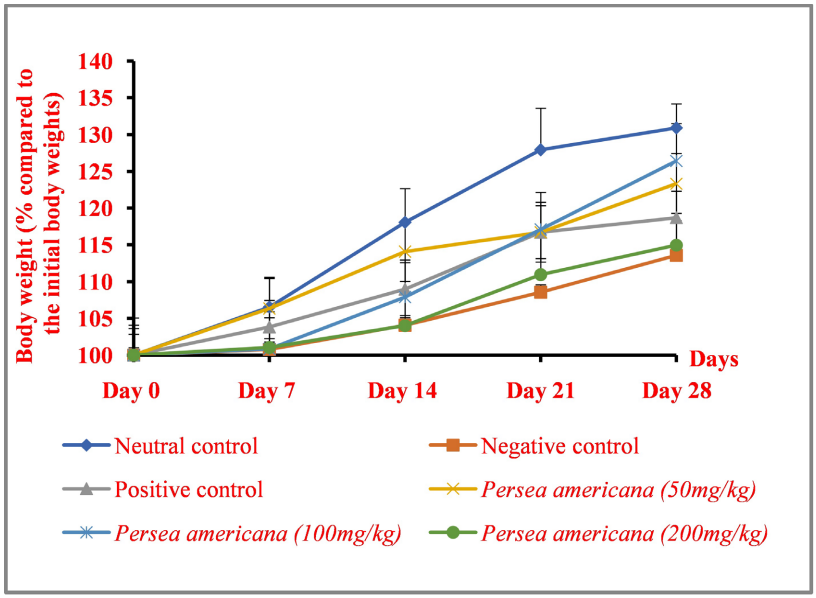
**Figure 2.** Effects of Persea americana leaf aqueous extract on water consumption of treated rats.

During 28 days of treatment of rats with *P. americana* (50 - 200 mg/kg), 2 days of ISO (150 mg/kg), and 10 days of propranolol (10 mg/kg), there was a variation

in water consumption of the rats in all groups from day 0 to 28. However, the mean water consumption did not vary significantly from the neutral control, negative control, positive control and *P. americana* treated groups. During the two days of ISO administration, there was a marked reduction in water consumption in all the groups (Figure 2). During the last week, water consumption was 493.4 ± 23.48 mL in the negative control group vs. 506.8 ± 48.18 or 590.2 ± 56.37 mL in animals treated with *P. americana* leaf aqueous extract respectively at 50 or 100 mg/kg (Figure 2).

#### 3.1.3. Effects of *Persea americana* Leaf Aqueous Extract on Body Weight

During 28 days of treatment of rats with aqueous *P. americana,* ISO (150 mg/kg), and propranolol (10 mg/kg), there was an increase in body weight of the rats in all groups from day 0 to 28. There was a drop in the 50 mg/kg *P. americana* group in the last week. However, the mean body weight gain did not vary significantly among the neutral control and *P. americana* treated groups at $P < 0.05$ (Figure 3). The average percentage increase in body weight throughout the treatment period was 13.58% in the negative control group vs. 23.34, 26.43, or 15.00% in animals treated with *P. americana* leaf aqueous extract respectively at 50, 100 or 200 mg/kg (Figure 3) during the last week of treatment.




Note: Each point on the line represents the mean, ±SEM, n = 5.

Figure 3. Effects of Persea americana leaf aqueous extract on body weight of treated rats.

### 3.2. Effects of *Persea americana* Leaf Aqueous Extract on Relative Heart of Treated Rats

During 28 days treatment of rats with *P. americana* (50 - 200 mg/kg), ISO (150 mg/kg), and propranolol (10 mg/kg), significant differences were not recorded in the mean of heart weights in all the groups treated. The positive control group recorded animals with the highest heart weight to body ratio and *Persea ameri-*

*cana* (200 mg/kg) + ISO recorded the lowest (Table 2).

Table 2. Effects of *Persea americana* leaf aqueous extract on Relative Heart Weight of Isoprenaline induce myocardial infarction in rat.

| Groups | Heart's Absolute Weight (g) | RHW (%) |
|---|---|---|
| **Group 1 neutral control** | 1 ± 0.07 | 0.36 ± 0.09 |
| **Group 2 negative control** | 1.32 ± 0.25 | 0.47 ± 0.02 |
| **Group 3 positive control** | 1.27 ± 0.17 | 0.51 ± 0.04 |
| **Group 4 test group 1** | 0.92 ± 0.06 | 0.38 ± 0.05 |
| **Group 5 test group 2** | 1.05 ± 0.22 | 0.41 ± 0.03 |
| **Group 6 test group 3** | 0.87 ± 0.08 | 0.35 ± 0.08 |

Note: Each value in the table represents the mean ± SEM, n = 5.

RHW = Relative heart weight

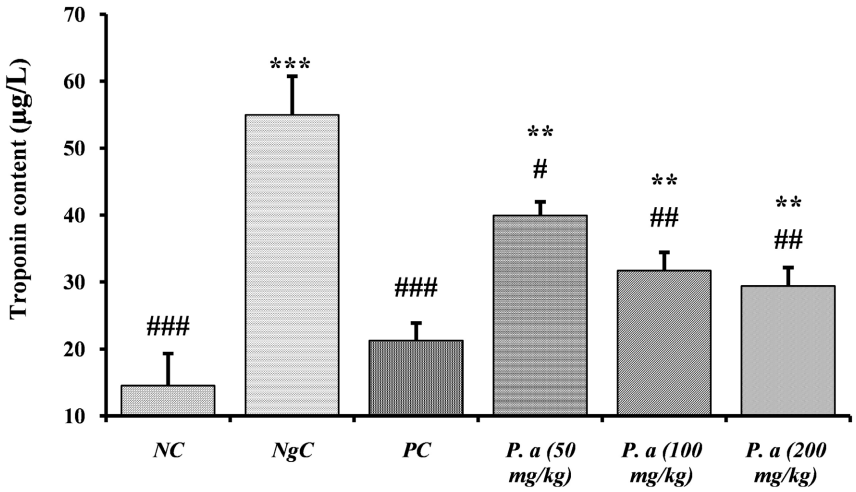
RHW (%) = HW ÷ BWAS × 100,

where:

HW= Heart weight and BWAS= Body weight at sacrifice.

### 3.2.1. Effects of *Persea americana* Leaf Aqueous Extract on Cardiac Biomarkers (Troponin I/T and Creatine-Kinase-MB) Levels in Isoprenaline-Induced Myocardial Infarct Rats

Effects of *Persea americana* leaf aqueous extract on Troponin I/T level in serum.



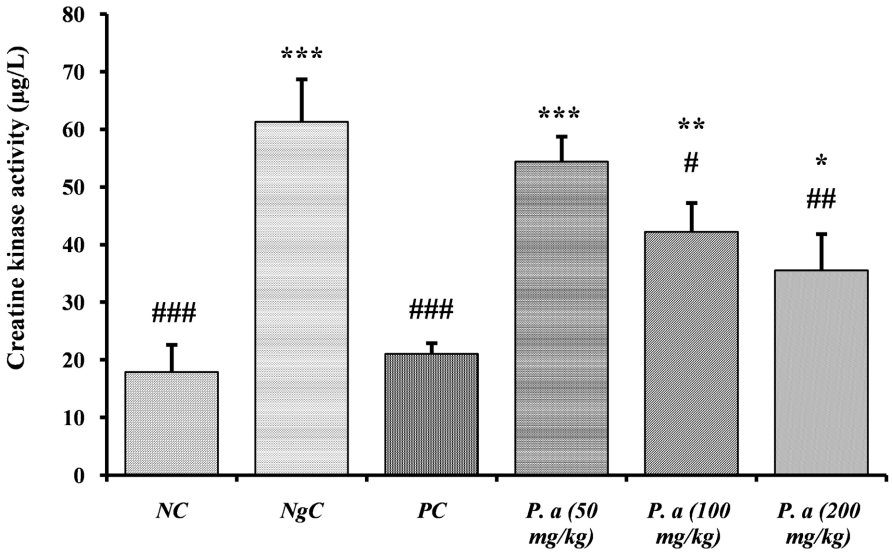

Note: Each bar represents the mean, ±SEM, n = 5, at #P < 0.05, ##P < 0.01, ###P < 0.001, **P < 0.01, ***P < 0.001 ANOVA, followed by Tukey multiple comparison test, #P < 0.05 significantly different from the negative control and *P < 0.05 significantly different from the positive control. The neutral control received only tap water, negative control received Isoprenaline, positive control received propranolol + Isoprenaline, and the test groups received Persea americana (50 mg/kg) + Isoprenaline, Persea americana (100 mg/kg) + Isoprenaline and Persea americana (200 mg/kg) + Isoprenaline.

Figure 4. Effects of Persea americana leaf aqueous extract on troponin level in the various treated groups.

Induction of myocardial infarction provoked an increase in troponin level; 54.96 ± 3.36 µg/L in the negative control vs. neutral control (14.49 ± 2.58 µg/L). Treatment with *P. americana* aqueous extract at 50, 100, or 200 mg/kg dose-dependently and significantly ($P < 0.05$, $P < 0.01$, $P < 0.001$) decreased the troponin level respectively to 39.97 ± 1.27 µg/L, 31.69 ± 1.75 µg/L, or 29.41 ± 0.01 µg/L (Figure 4). There was a decrease in the positive control animals to 21.23 ± 1.39 µg/L.

### 3.2.2. Effects of *Persea americana* Leaf Aqueous Extract on Creatine-Kinase-MB (CK-MB) Level in Serum

There was an increase in the level of Creatine-kinase-MB in the other groups compared to the neutral control from 17.88 ± 4.74 µg/L to 61.28 ± 5.07 µg/L (negative control), to 54.39 ± 3.10 µg/L, 42.18 ± 2.62 µg/L and 35.50 ± 3.73 µg/L (in ISO + *P. americana* 50 mg/kg, 100 mg/kg and 200 mg/kg treated groups) respectively. In the positive control, the level of CK-MB was elevated to 21.03 ± 1.0 µg/L vs. neutral control (Figure 5).




Note: Each bar represents the mean, ±SEM, n = 5, at #$P < 0.05$, ##$P < 0.01$, ###$P < 0.001$, *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ ANOVA, followed by Tukey multiple comparison test, #$P < 0.05$ significantly different from the negative control and *$P < 0.05$ significantly different from the positive control. The neutral control received only tap water, negative control received Isoprenaline, positive control received propranolol + Isoprenaline, and the test groups received Persea americana (50 mg/kg) + Isoprenaline, Persea americana (100 mg/kg) + Isoprenaline and Persea americana (200 mg/kg) + Isoprenaline.

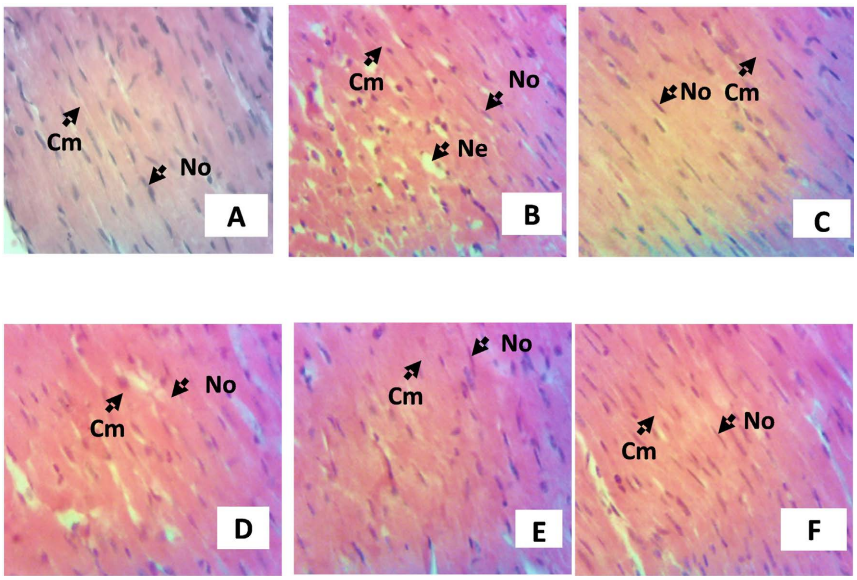
Figure 5. Effects of Persea americana extract on CK-MB of the different rat groups.

### 3.2.3. Effects of *Persea americana* Leaf Aqueous Extract on the Heart Tissue Architecture of Rats with Isoprenaline-Induced Myocardial Infarction

The 6 groups receiving different treatments exhibited many differences in the level of destruction and pathological changes in the cardiac tissue. Generally, treatment with ISO caused the cells to lose the normal appearance, possessed inhomogeneous content, and some fibres and cells lysed. Myocytes showed variable degree of

damage induced by ISO. Heart tissues as observed after the histological study indicated a pattern of damage as several long haphazard cuts (infarctus).

Infarction was highest in the negative control (rats administered with ISO only). In the positive control (rats administered with both ISO and its standard antagonist, propranolol), infarcts were less observed. In Groups 4 (aqueous *Persea americana* (50 mg/kg) + ISO), 5 (aqueous *Persea americana* (100 mg/kg) + ISO) and 6 (aqueous *Persea americana* (200 mg/kg) + ISO) the heart was not damaged, the architecture of the heart was similar to those in the neutral and positive controls (Figure 6).




Note: A = Neutral control; B= Negative control; C = E50; D = E100; E = E200; F = Positive control; Ne= Necrotic cell; No = Nucleus of cardiomyocyte; Cm = Cardiomyocyte.

Figure 6. Microhistology of the heart tissue in rats induced Isoprenaline myocardial infarction treated with *Persea americana* leaf aqueous extract (×200).

## 4. Discussion

This study was carried out to determine the effects of *Persea americana* on cardiac biomarkers (CK-MB and troponin I) and structural changes as indicators of myocardial infarction in ISO treated rats. In this study, acute MI was induced by subcutaneous administration of ISO (150 mg/kg/day) in rats. There was a significant rise in serum biomarkers (CK-MB and troponin I) in ISO-treated rats; this was in line with some previous reports [32]. Pretreatment with *P. americana* showed a significant reduction in the levels of all serum diagnostic biomarkers compared to the ISO group (negative control).

There was a variation in water and food consumption of the rats in all groups from day 0 to 28. However, the mean water and food variations did not vary significantly among all the groups in the study. There was an increase in body weight of the rats in all groups from day 0 to 28. This was because animals were given water and food *ad-libitum,* and the experiment started in young rats of 4-6weeks,

still growing up. Higher body weights generally increases water and food consumption due to higher metabolic demands and larger tissue volume. However, the mean body weight gain did not vary significantly among all the groups in the study. There was a relatively low percentage body weight increase in the treatment groups (50, 100 or 200 mg/kg of *P. americana*) compared to the negative control which received only ISO (150 mg/kg). This could be accounted for by the fact that *P. americana* helps lower body cholesterol, hastens lipid catabolism, acts as an antidepressant, and may act as a potential appetite depressant. Also *P. americana* could have delayed satiety [25] [27] [29]. The weight loss effect may be linked to tannins, saponins and flavonoids which contribute to improved metabolism and potential appetite inhibition [25] [33].

As concerns troponin levels, there was a significant increase in the negative control group treated with only ISO compared to the neutral control group. The significant increase in the negative control could be due to the administration of ISO (150 mg/kg) only. Myocardial tissues can be damaged by ISO leading to the release of troponin by myocytes as observed in the negative control with the highest quantity of troponin released. There was a reduction of this rise of troponin level by the administration of propranolol, a known antagonist of ISO; this was in line with the findings of [34]. In the *P. americana* (50 mg/kg) + ISO, *P. americana* (100 mg/kg) + ISO and *P. americana* (200 mg/kg) + ISO, the increase in troponin level which indicates a damage caused by ISO (150 mg/kg), was reduced by *P. americana*. *P. americana* from the above results showed it could be capable of reducing the level of troponin. The normal level of troponin in blood serum has a range of 2 - 15 μg/L and 5 μg/L for the mean [35] [36]. There was a dose dependent decrease in the level of troponin, indicating that *P. americana* at doses 50, 100, and 200 mg/kg induced significant decrease levels of troponin in blood, comparatively to negative control.

As regards creatine-kinase-MB (CK-MB) levels, there was a significant ($P < 0.05$) increase in the negative control compared to neutral control. The level of Creatine-kinase was highest in the negative and lowest in the neutral control. CK-MB level was significantly higher in the negative control compared to *P. americana* (50 mg/kg) + ISO, *P. americana* (100 mg/kg) + ISO and *P. americana* (200 mg/kg) + ISO. This marked increase in CK-MB in the negative control confirms that there were damages in the myocardial tissues caused by ISO. There was a significant decrease in CK-MB in the positive control compared to the negative control indicating propranolol reduced the level of damage caused by ISO, and this was further confirmed by histopathological analysis. There was a significant decrease in the level of CK-MB in the *P. americana* (50 mg/kg) + ISO, *P. americana* (100 mg/kg) + ISO and much reduced in *P. americana* (200 mg/kg) + ISO, which significantly prevented the rise of CK-MB in blood serum likely by preventing the damage of cardiomyocytes. This is in line with the results of [37]. Histological findings permitted to better understand the biochemical observations.

Cardiac tissue of the neutral control group presented a normal architecture, with distinct nuclei in cardiomyocytes. Architectural damage was highly demonstrated

in the negative control but much reduced in the positive control. While in the 50 mg/kg, 100 mg/kg and 200 mg/kg of the extract of *P. americana*, there were less observable damages to the tissues. Hence, there was necrosis, cellular arrangement was disorganised and nuclei disappeared in the negative control. Some authors also reported similar changes in subepicardial myocardium [29]. These damages were pronounced compared to the positive control, thus proving the capacity of propranolol to prevent (or reduce) ISO-induced myocardial infarction. The plant extract mimics the action of propranolol. The cardioprotective effects of *P. americana* could be attributed to its phytochemical constituents, particularly phenolic compounds, flavonoids, carotenoids, and monounsaturated fatty acids [20] [38].

## 5. Conclusion

This study demonstrated that *P. americana* aqueous extract, which has been used empirically to manage hypertension, confers significant cardioprotection against ISO-induced MI in rats. This cardioprotection was through the prevention of the rupture of the cardiomyocyte sarcolemma and consequently the elevation of Troponin I and CK-MB levels.

## Ethical Statement

The protocol for this research was carried out strictly according to guidelines for the care and use of laboratory animals. An authorization (UB-IACUC N˚ 25/2025) was obtained from the University of Buea Institutional Animal Care and Use Committee (UB-IACUC).

## Conflicts of Interest

The authors of this manuscript do not have any conflict of interest in line with the publication of this article.

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## Abbreviations

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| BWAS | Body Weight at Sacrifice |
| CK-MB | Creatine kinase MB |
| HW | Heart Weight |
| ISO | Isoprenaline |
| MI | Myocardial Infarction |
| RHW | Relative Heart Weight |
| AMI | Acute Myocardial Infarction |
| CAD | Coronary Artery Diseases |