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Effect of Flavonoid Rich Fraction of *Coriandrum sativum* Leaf on Lipid Profile, Nitric Oxide, Ang II and Cardio Histopathology in L-NAME Intoxicated Experimental Rats

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Abstract

Coriandrum sativum has been used in traditional medicines as an anti-inflammatory, analgesic, and antibacterial agent. It is recently been shown to have antioxidant activities. This study evaluated the effects of Flavonoid Rich Fraction of *Coriandrum sativum* Leaf (FRFCSL) on Lipid Profile, Nitric Oxide, Ang II and Cardio Histopathology in L-NAME intoxicated Experimental Rats. Standard analytical method and DPPH radical scavenging activity were employed for the phytochemicals and antioxidant analysis respectively. The acute toxicity study showed the extract and flavonoids fraction are nontoxic at 5000mg/kg body weight. Thirty rats were divided into five groups of six (6) rats each. Group 1 was administered water and feed only, Group 2 was administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) without treatment, Group 3 through 5 were administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) with concomitant administration of Captopril (20mg/kg b.w), FRFCSL (200mg/kg b.w) and FRFCSL (400mg/kg b.w) respectively for 21 days. In phytochemical screening, presence of flavonoids, saponins, tannins, alkaloids, cardiac glycosides, steroids were confirmed as part of secondary metabolites in the extract. The flavonoid fraction showed increase % DPPH radical inhibition in concentration-dependent manner. FRFCSL treatment significantly ($p<0.05$) and dose-dependently lowered low density lipoprotein and triglycerides. Also It significantly ($p<0.05$) prevented L-NAME induced decrease in serum angiotensin II, high density lipoprotein and serum nitric oxide concentrations compared to the untreated rats. The Flavonoid Rich Fraction of *Coriandrum Sativum* Leaf showed great potential as antihypertensive, antihyperlipidemic and cardioprotective agent in rats thus confirming its usefulness in traditional health therapy and potential for antihypertensive drug development.

Keywords: antihyperlipidemic, antihypertension, cardioprotective, Flavonoid Rich Fraction, *Coriandrum sativum*.

INTRODUCTION

Nature has blessed mankind with plants that contain some active metabolites in them and could be the potential source of drugs for the management of diseases (Kharat and Mendhulkar, 2016). A lot of people on earth depend on plant materials as a source of medicine (Ogunrinola *et al.*, 2019), and WHO has recommended further investigation into traditional herbs specifically in the area of chronic and debilitating illnesses and diseases such as infertility, diabetes, malaria, high pressure, dysentery, worm infestation, cancer, diarrhea, cardiovascular disease and many more illness/diseases (Ogunrinola *et al.*, 2019).

Cardiovascular disease (CVD) is a pathological process that affects the arterial system as a whole and determines the progressive narrowing of the arteries, up to their complete obstruction"(Angiolillo *et al*., 2021). Hypertensive heart disease is considered to be the first cause of death associated with high blood pressure and is actually a group of disorders that include heart failure, ischemic heart disease, and left ventricular hypertrophy (Liang *et al*., 2010). (Kate, 2012) revealed that there is a positive relationship

between increased plasma total cholesterol and low-density lipoprotein cholesterol and increased incidence of coronary heart diseases. Atherosclerosis is an accumulation of fats in arteries and this causes the narrowing of arteries slowing down the flow of blood to the heart (Oyewole *et al*., 2012). Major identified risk factors are elevated LDL cholesterol, reduced HDL cholesterol, hypertension, and non-insulin-dependent diabetes mellitus. Oxidative stress results from an imbalance between the generation of reactive oxygen species and endogenous antioxidant systems (Joshi *et al*., 2012). The oxidative modification of Low-density lipoprotein (LDL) plays a pivotal role in the progression of atherosclerosis (Joshi *et al*., 2012).

Nonetheless, plants contain bioactive compounds which makes them the interest of many researchers, and they are used in their purified form as; anti-inflammatory agents, anticancer, antioxidants, antineoplastics, and even neuroprotective agents (Rostoka *et al*., 2010). Flavonoids being one of the secondary metabolites in plants are responsible for ameliorating mortality from nitric oxide-dependent processes: ischemic heart disease, stroke, diabetes mellitus, and cancer (Rostoka *et al*., 2010). *Coriandrum sativum* is widely distributed and mainly cultivated for the seeds. Previous studies claims that flavonoids can be able to reduce the hyperlipidemia revealing that Coriander's flavonoids include quercetin, kaempferol, apigenin and acacetin and the phenolic acids identified are vanillic acid, ferulic acid (cis and trans form), p-coumaric acid and caffeic as described and reported by (Joshi *et al.*, 2012). Flavonoids are a class of low molecular weight phenolic compounds, widely distributed in plants. They possess variable phenolic structures, and are widely distributed in fruits, vegetables, grains, bark, roots, stems, flowers, tea and wine (Anorue *et al.*, 2020). One of the unique features of flavonoids which makes them pharmacologically active is their antioxidative property (Anorue *et al.*, 2020). Anorue & Ekpo further stated that "Unlike other phytochemicals which are shown to undergo oxidation with the human haemoglobin when ingested either as food or drug, flavonoids have been reported to be safe for human consumption without undergoing any oxidative reactions with the human haemoglobin". However, *Coriander sativum* has been associated with pharmacological activities specifically in management of heart related diseases (Arun Sam Lal *et al*., 2004).(Das *et al*., 2019). Since flavonoids have good antioxidant properties which make them a good compound to manage ailments associated with the heart caused by oxidation or imbalance in the body system.

It is very necessary to search for safe and potent herbal medications that have to been validated by traditional users in order to standardize them by assessing their efficacy and safety through scientific validations (Chethankumara *et al.*, 2021). This present study therefore evaluated the effect of Flavonoid Rich Fraction of *Coriandrum Sativum* Leaf on Lipid Profile, Nitric Oxide, Ang II and Cardio Histopathology in L-NAME intoxicated Experimental Rats.

MATERIALS AND METHOD

Plant Collection

Fresh leaves of *Coriandrum Sativum* were collected from Nekede Owerri, Imo State Nigeria. The plants were identified and authenticated by a Plant Taxonomist at Michael Okpara University of Agriculture Umudike. Voucher specimens were deposited at the Departmental herbarium with Voucher No: DPSBH 564. The leaves were washed with distilled water and air dried for seven days. The dried leaves were pulverized into fine powder using Pulverize machine (5126 TP) and preserved in cellophane bags until when used.

Preparation of Plant Extract And Flavonoid Extraction

One thousand five hundred gram (1500g) of powdered leaves was macerated in 2.5L of 80% methanol at room temperature for 72h. It was continuously mixed and then filtered using a filter paper (Whatman size No.1). The filtrate was dried in a water bath at 45ºC and concentrate was kept in air tight bottle at 4°C until used. The extract obtained was subsequently extracted in petroleum ether, diethyl ether and ethyl acetate following the method of Subramanian and Nagarajan (1969) as used by (Ajah *et al*., 2022). Petroleum ether fraction was discarded due to its being rich in fatty substances. Ether fraction was used for free flavonoids whereas ethyl acetate fraction for bound flavonoids. Ethyl acetate fraction of the sample was hydrolysed further with 7% Sulphuric acid for 24hours and was then re-extracted with ethyl acetate. The fraction obtained was repeatedly washed with distilled water to neutrality, dried and weighed.

Phytochemical Analysis

A small amount of the crude extract was used for the phytochemical analysis. The phytochemical tests include the test for alkaloids, flavonoids, tannins and phenols, saponins, steroids, and cardiac glycoside adopting the approach of (Ashika *et al.*, 2018) and (Patel *et al.*, 2016).

Antioxidant Evaluation Using DPPH Free Radical Scavenging Activity

The free radical scavenging capacity of the flavonoids fraction was determined by using stable free radical, 2,2-diphenyl-1-picrylhydrazyl (DPPH) according to the method proposed by (Brand *et al.*, 1995) in the report of (Alamgeer *et al.*, 2017).

Acute Toxicity (LD_{50})

The median lethal dose (LD50) of the extract and fraction were determined by the method of Lorke

(1983). Six groups of three adult albino-mice each weighing between 14 and 22g were used for this study.

Experimental Animals

Thirty Adult Albino rats were obtained from the Animal House of Nnamdi Azikiwe University Awka. The animals were house in cages and Standard laboratory protocols for animal studies were maintained. Care of experimental animals was taken as per the guidelines given by NRC (2011) and approval for animal studies was obtained from the Ethical Committee of the Department of Physiology and Pharmacology, College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike with the Ethical Clearance Number - MOUAU/VPP/EC/20/021. The animals were acclimatized for two weeks and maintained at the optimum temperature and relative humidity with 12 h light/dark cycle. The animals were allowed feed and water *ad libitum*.

Experimental Design

The rats were divided into five groups of six (6) rats each as follows:

Group I: Was administered water and feed only which served as Normal control.

Group II: Was administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) alone

Group III: Was administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) with concomitant administration of Captopril (20mg/kg b.w) for 21 days

Group IV: Was administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) with concomitant administration of flavonoid fraction of *Coriander sativa* leaf (200mg/kg b.w) for 21 days

Group V: Was administered 40mg/kg N-Nitro-L-Arginine Methyl Ester (L-NAME) with concomitant administration of flavonoid fraction of Coriander sativa leaf (400mg/kg b.w) for 21 days.

Termination of Treatment

Treatment was stopped 2 days before the termination in order to study the long-term effects of the extract without involvement of the effects of acute administration (Tata *et al*., 2019). Rats were fasted for 16h, weighed and terminated individually by carbon dioxide inhalation followed by cardiac puncture for blood collection. Collected blood was centrifuged at 1300 rpm for 15 min to obtain serum. Hearts were harvested and divided into two portions half of which was fixed in 10% buffered formalin for histopathological analysis.

Determination of Lipid Profile of Animals

Triglycerides, low density lipoprotein cholesterol (LDL) and high density lipoprotein cholesterol (HDL) were measured using kits from Randox Laboratory (Randox co. UK) following protocol described by manufacturer. Total cholesterol and very low density lipoprotein (VLDL) were calculated using Friedewald equation as described by (Vuilleumier *et al.,* 2010) in the report of (Tata *et al.,* 2019).

VLDL = TG/5.

TC = HDL + LDL + VLDL.

Plasma Nitric Oxide Metabolites

Briefly, 100 µL of plasma was incubated with 50 µL of nitrate reductase buffer (0.1 M potassium phosphate buffer containing 1 mM β NADPH and 2 U/mL nitrate reductase) for 30 min at 37° C. One hundred microliters of N-(1-Naphthyl) ethylenediamine (NED) and sulfanilamide was added to the above mixture and the absorbance was measured at 540 nm using biochemistry analyzer after incubation for 15 min at room temperature. The amount of nitrite/nitrate present in the sample was estimated from the standard curve (Kanthlal *et al*., 2020).

Determination of Angiotensin II Concentration in Serum

Ang II concentrations were determined in serum by enzyme linked immunosorbent assay (ELISA) using pre-coated commercial kits and by competitive ELISA method as described in the report of (Tata *et al.,* 2019).

Cardio Histopathology Examination

The isolated heart after sacrifice was kept in 10% neutral formalin saline for histopathology analysis. The aortic sample was dehydrated and embedded in paraffin. Five µm thick sections were mounted on glass slides. After deparaffinization and rehydration, they were stained with hematoxylin-eosin in order to assess the histological injuries and collagen accumulation in tissues. Histological analysis was performed with light microscope (Kanthlal *et al*., 2020).

Statistical Analysis

Statistical analysis was carried out using SPSS version 23 for Windows (IBM Statistics for Social Sciences). One-way analysis of variance (ANOVA) followed by Duncan's posthoc test for multiple comparisons were performed to determine differences between treatment groups. A p-value less than 0.05 were considered statistically significant. Results were expressed as mean ± standard error of the mean (SEM).

RESULTS AND DISCUSSION

Acute Toxicity Study

Following Lorke's method for acute toxicity evaluation, both the extract and flavonoid rich fraction of C sativa showed no toxicity even at the highest dose of 5000mg/kg thus indicating the plant is safe at the doses used in this study.

Preliminary qualitative phytochemical tests

In accordance to standard analytical procedure for the analysis of qualitative phytochemicals, the presence of flavonoids, saponins, tannins, alkaloids, cardiac glycosides, steroids were confirmed part of secondary metabolites in the extract (table 1).

Table 1: Showing preliminary Phytochemicals content of *Coriander sativa* leaf extract

Phytochemicals	Inference
Flavonoids	++
Tannins	+
Saponin	+
Alkaloids	+
Cardiac glycoside	+
Steroids	+
Phenols	+

The phytochemical result showed that *C. sativum* contains moderate (+) amount of the most common phytochemicals but has flavonoid much in abundance (++) which makes it the phytoconstituent of interest for study.

Inhibition of DPPH by Flavonoid Rich Fraction of *Coriander Sativa* (FRFSC) Leaf

Increase of % inhibition in concentration-dependent manner was observed in the extract as shown in figure 1

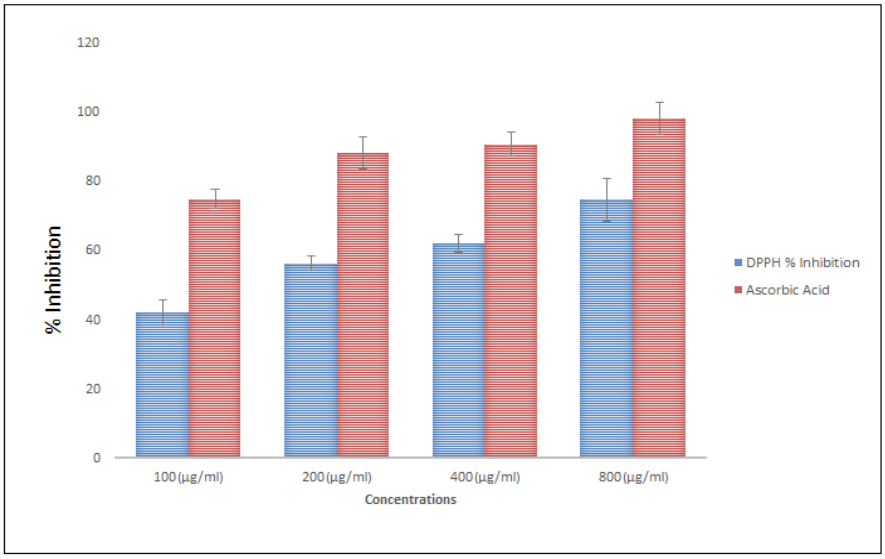

Figure 1: Effect of flavonoid rich fraction of *Coriander sativa* leaf on DPPH scavenging activity

Effect of the Flavonoid Rich Fraction of *Coriander Sativa* Leaf on Lipid Profile

The effect of flavonoid rich fraction on the lipid profile in L-NAME intoxicated rats is shown in Table 1. For the Triglyceride, group I & V were non-significantly (P>0.05) different from each other. Group II, III and IV were significantly different (P<0.05) from each other and group II were significantly (P<0.05) higher when compared to all groups.

In High-Density Lipoprotein, group I, II, and V were significantly different (P<0.05) from each other but group III and IV were non-significantly (P>0.05) different from each other. The HDL result revealed that group II were significantly (P<0.05) lower on comparison to other groups showing that induction of L-NAME in the rats decreased the HDL level.

Result of Total cholesterol showed group III & V were non-significantly (P>0.05) different, group I & IV also were non-significantly (P>0.05) different but group II were significantly (P<0.05) higher when compared to other groups revealing that induction of L-NAME increased the TC levels in the rats.

Very Low Lipoprotein Density (VLDL) result showed that group I, III & V are insignificant (P<0.05) from each other. Group IV were equally non-

significantly (P>0.05) different from group III while group II were significantly higher when compared to all groups upon induction with L-NAME as seen in Table 1.

In Low-Density Lipoprotein level, group II were significantly (P<0.05) higher compared to other treatment groups. Group I, III, IV & V were significantly (P<0.05) lower in a dose-dependent manner when compared to group II.

Table 1: Effect of the flavonoid rich fraction of *Coriander sativa* leaf (FRFCS) on lipid profile in L-NAME intoxicated experimental rats

Groups	Treatment	TG (mg/dl)	HDL (mg/dl)	TC (mg/dl)	VLDL	LDL
I (Normal Control)	Water alone	74.86±1.20^{a}	65.20±2.4^{d}	128.50±6.78^{b}	14.96±1.12^{a}	48.34±2.14^{a}
II (Negative Control)	40mg/kg L-NAME alone	88.20±3.08^{d}	27.80±2.04^{a}	136.50±1.18^{c}	17.64±2.08^{c}	91.06±5.08^{e}
III (Positive Control)	40mg/kg L-NAME + 20mg/kg captopril	77.82±1.05^{b}	38.00±1.80^{b}	120.40±2.20^{a}	15.56±0.88^{ab}	66.84±3.00^{c}
IV	40mg/kg L-NAME + FRFCS 200mg/kg	80.50±2.04^{c}	39.80±0.80^{b}	127.18±1.50^{b}	16.10±0.90^{b}	71.28±2.40^{d}
V	40mg/kg L-NAME + FRFCS 400mg/kg	72.70±3.08^{a}	45.00±1.60^{c}	118.90±2.70^{a}	14.54±1.05^{a}	59.36±3.18^{b}

The above results are mean ±SEM of triplicate determination. Different alphabetic in same column differ significantly (p<0.05).

Effect of the Flavonoid Fraction of *Coriander Sativa* Leaf on Nitric Oxide Concentration

Result as seen in figure 2, showed the Nitric oxide concentration for group I, III, V where non-significantly (P>0.05) different revealing that flavonoid rich fraction *Coriander sativa* leaf at 400mg/kg b.w could increase the nitric oxide levels. Group II was significantly (P<0.05) lower from other groups.

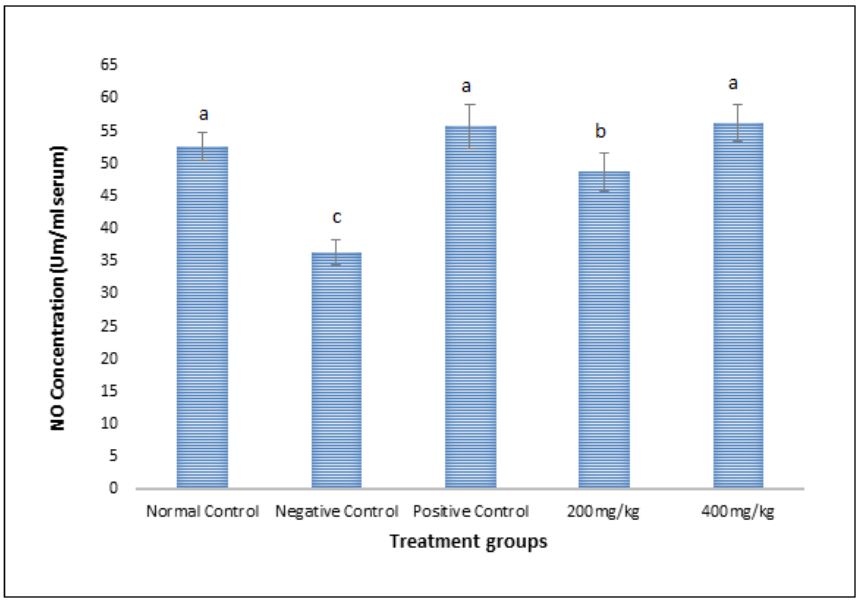

Figure 2: Effect of the flavonoid rich fraction of *Coriander sativa* leaf on Nitric oxide concentration in L-NAME intoxicated experimental rats.

Effect of the flavonoid rich fraction of *Coriander sativa* leaf on Angiotensin II (Ang II) concentration

Serum Ang II concentration result as seen in figure 3, were not significantly (P> 0.05) different from each other. Result reveals that induction of L-NAME insignificantly did not decrease the Ang II serum level of the rats in all groups.

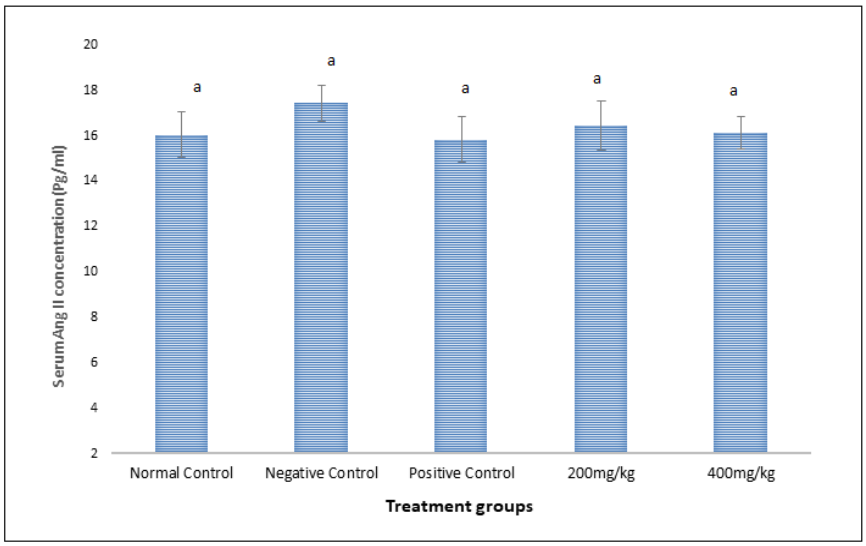

Figure 3: Effect of the flavonoid rich fraction of *Coriander sativa* leaf on Angiotensin II (Ang II) concentration in L-NAME intoxicated experimental rats

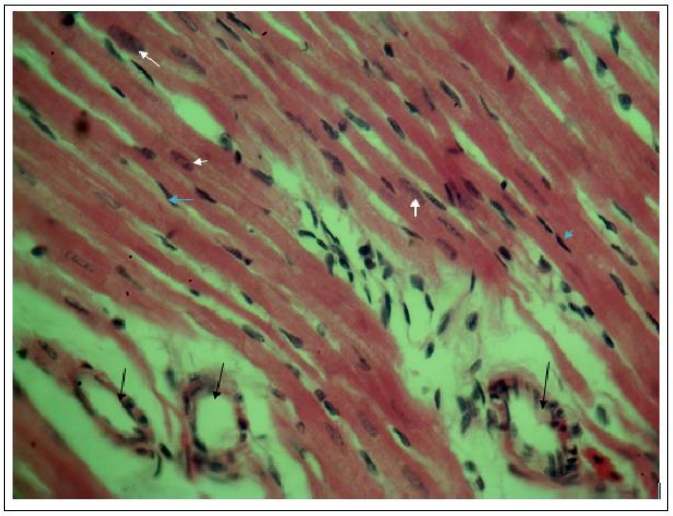

Figure 4: Histomorphology of the heart Section from Normal control group showed the normal myocardial histology. Normal cardiomyocytes with normal centrally located and elongated nuclei (white arrow), arranged in interwoven bundles were observed. Blood vessels (black arrow); pericytes (blue arrow) H&Ex400

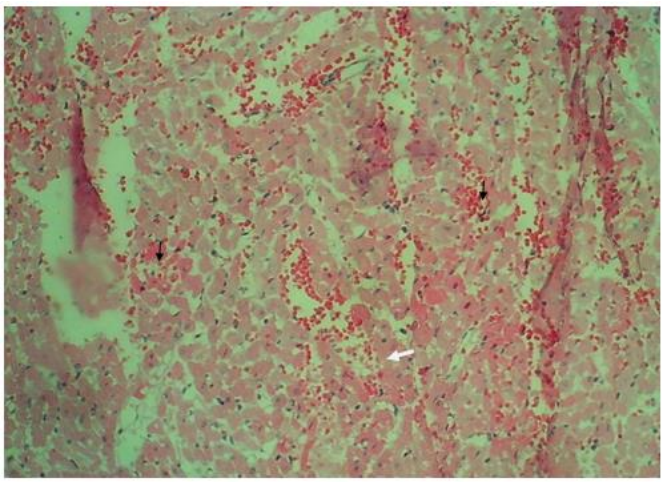

Figure 5: Histomorphology of the heart Section from a group administered L-NAME alone (40mg/kg b.w) showed severe widespread myocardial necrosis. Affected areas showed fragmentation and loss of striations (white arrow) admixed with typical Zenker's necrosis (black arrow)

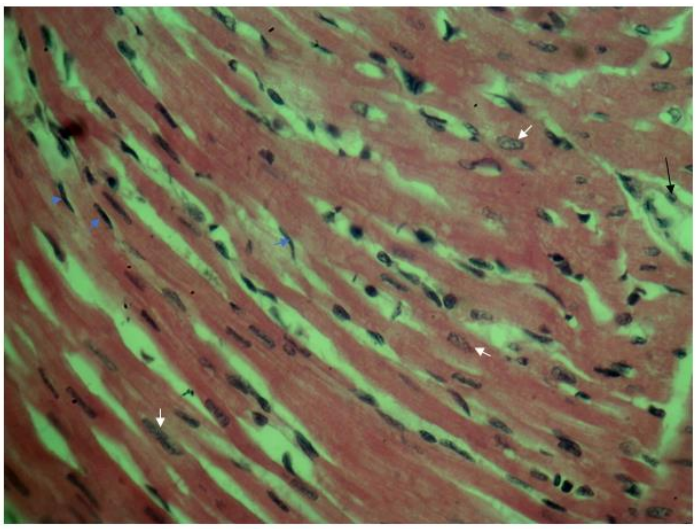

Figure 6: Histomorphology of the heart Section from a group administered L-NAME (40mg/kg b.w) with concomitant administration of Captopril (20mg/kg b.w) showed the normal histo-architecture of the myocardium. Nuclei (white arrow); Pericytes (blue arrow); blood vessel (black arrow). H&Ex400.

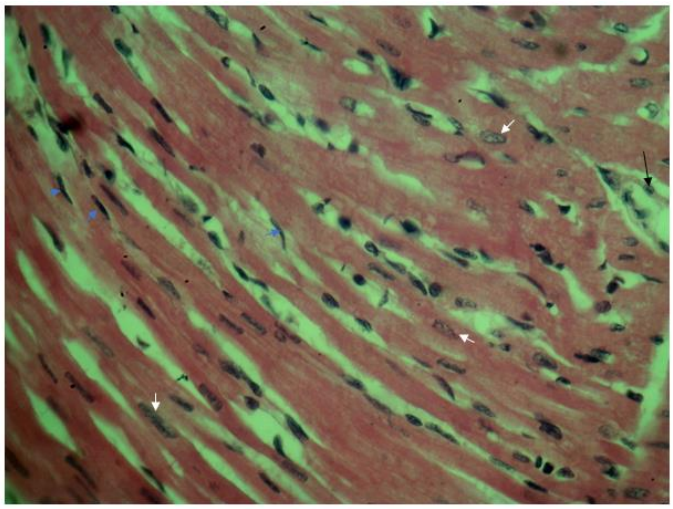

Figure 7: Histomorphology of the heart Section from a group administered L-NAME (40mg/kg b.w) with concomitant administration of Coriander sativa leaf extract (200mg/kg b.w) showed the normal histo-architecture of the myocardium. Nuclei (white arrow); Pericytes (blue arrow); blood vessel (black arrow). H&Ex400.

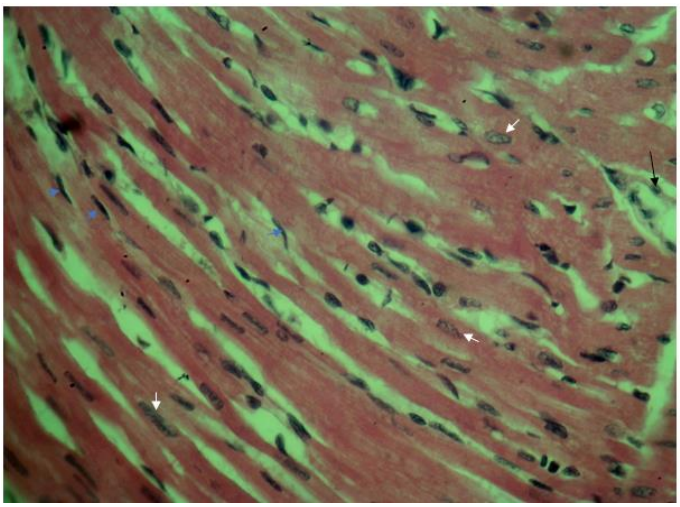

Figure 8: Histomorphology of the heart Section from a group administered L-NAME (40mg/kg b.w) with concomitant administration of Coriander sativa leaf extract (400mg/kg b.w) showed the normal histo-architecture of the myocardium. Nuclei (white arrow); Pericytes (blue arrow); blood vessel (black arrow). H&Ex400.

DISCUSSION

Phytochemicals in plant play a vital role in disease management when consumed. Flavonoid is one of the most common phytoconstituents seen in plants. They have been attributed to the antioxidant activity of their polyphenolic compounds (Benito *et al*., 2002). The presence of flavonoids in *C. sativa* has been validated scientifically by previous studies (Ahmed *et al*., 2018; Patel & Vakilwala, 2016). With the revelation of a low cardiovascular mortality rate and the prevention of CHD, research on flavonoids has gotten a boost. The functional mechanisms of flavonoids are still not completely known. Plant-derived compounds, on the other hand, have been extensively recognized for millennia as having a wide range of biological activities (Panche *et al*., 2016). Catechins and quercetin have been shown to lower blood pressure in human randomized controlled trials (RCTs). Hypothetically, Flavonoids work to lower blood pressure by increasing nitric oxide (NO) bioavailability, decreasing endothelial cell oxidative stress, and modulating vascular ion channel activity (Maaliki *et al*., 2019). As earlier stated, flavonoids are associated greatly with antioxidant activities. Result of the present study revealed that flavonoid rich fraction of *C. sativa* showed a good antioxidant potential in increasing concentrations. The antioxidant activity of flavonoids, which is attributable to their capacity to inhibit free radical production and scavenge free radicals, has gotten the most attention. Several investigations on the ability of flavonoids to act as antioxidants in vitro have been conducted in recent years, and significant structure-activity connections for antioxidant activity have been identified. Flavonoids' antioxidant activity in vivo is less well documented, owing to a lack of knowledge about their absorption in humans (Pietta, 2000). The majority of ingested flavonoids are metabolized to different phenolic acids, some of which still have radical-scavenging properties (Pietta, 2000).

Lipid abnormalities play a key part in the development and progression of atherosclerosis and cardiovascular disease, according (Ogunrinola *et al*., 2019). It is also known that change in serum lipid profiles could cause a significant increase to the risk of coronary heart disease (Chattopadhyay *et al*., 2006). A high-cholesterol diet has been shown to raise total cholesterol and increase the risk of cardiovascular disease. The modulation of cholesterol is employed by many medications to minimize the risk of CVD. Many significant nutritional studies have recently been conducted on the medicinal advantages of plants (Oyewole *et al*., 2012; Pokhrel *et al*., 2015). HDL level was significantly reduced upon administration of L-NAME but administration of the flavonoid-rich fraction *C. sativa* significantly increased the HDL level in reference to the normal rats while at 400mg/kg dose, it exhibited more activity than the standard drug. Studies have shown that high concentrations of HDL have protective value against cardiovascular diseases such as ischemic stroke and myocardial infarction (Soudjin *et al*., 2007). Flavonoid-rich fraction *C. sativa* decreased the LDL level when compared to the control group LDL cholesterol levels are likely to be lower as a result of rapid hepatic cholesterol conversion to bile acids and enhanced expression of LDL receptors on cell surfaces (Pokhrel *et al*., 2015). Low serum triglyceride (TG) in blood indicates protection against coronary heart diseases. Elevated serum TG is considered an independent risk factor for CVD (Pokhrel *et al*., 2015). TG concentration in rats treated with the fraction was found to be significantly low as compared to negative control. TC and VLDL concentration in rats treated with fraction at various doses used and standard drug (captopril) were also found to be significantly low as compared to negative control and the result of the analysis was in line with the study of (Ramadan *et al*., 2008).

Chronic disorders, such as hypertension, are almost always accompanied with oxidative stress, which is the cause of their complications (Bilanda *et al*., 2019). The study revealed that the flavonoid rich fraction *C. sativa* significantly prevented the deleterious effects of L-NAME in the tissue NO content in reference to the control group and standard test group. Flavonoid rich fraction as seen in the study maintained NO production. Thus, the antihypertensive as well as the flavonoid rich fraction of *C. sativa* may be at least partially attributed to the increase in NO production, which is known as an inhibitor to cell proliferation. Moreover, by stimulating cardiovascular NO synthesis, the fraction could induces vasorelaxation, improves arterial wall compliance and control of blood pressure (Nyadjeu *et al*., 2013). NO produced by nitric oxide synthase (NOS) enzymes, is a key modulator of vascular and cardiac function, including vessel tone and heart contractility and rate. A decrease in NO levels is associated with cardiovascular disease and hypertension (Calabró *et al*., 2018).

Additionally, the present study result showed that L-NAME had insignificant ($p>0.05$) reduction on Ang II serum concentration in all the groups. Ang II is a vasoconstrictive hormone that increases the systemic blood pressure, renal perfusion pressure and the glomerular filtration rate (Ntamo *et al*., 2016). Ang II also enhances nitric oxide (NO) generation. Previous study by Tata *et al*. (2019) demonstrated that L-NAME significantly decreased Ang II concentration. The report contradicts the result of this present study where reduction in Ang II level was not observed in the L-NAME group. Furthermore, the flavonoid-rich fraction of *C. sativa*'s ability to maintain normal serum Ang II concentration suggested that it reduced blood pressure through maintaining a balance between Ang II and NO (Tata *et al*., 2019). However the antihypertensive and cardioprotective ability of *C. sativa* from this study has

been validated by many researchers in the systematic report of (Mahleyuddin et al., 2022).

The histopathological results revealed no morphological alterations in the heart of the animals in group I, III, IV and V. Severe widespread myocardial necrosis, fragmentation and loss of striations admixed with typical Zenker's necrosis was observed in the heart tissue from group II (fig 5), indicating that the heart tissue was damaged as a result of L-NAME administration. The heart tissue of L-NAME with concomitant treatment with captopril, 200, 400mg/kg FRFSC, displayed in (Fig 6-8) shows no changes in cardiac structure and is similar to that of the normal control group (fig 4). Thus, the plant flavonoid fraction has some protective effect and anti-hypertensive potential.

CONCLUSIONS

The oral administration of flavonoid rich fraction of *C. sativum* has protective effect against hypertension induced by L-NAME in rats and this effect may be achieved due to the presence of the abundant flavonoids which prevents the inhibitory effect of L-NAME on nitric oxide release thus, leading to smooth muscle relaxation resulting in vasodilatation. The study confirmed that *Coriander sativa* have significant anti-hyperlipidemic effect as well as prevented L-NAME-induced changes in regulators of blood pressure like nitric oxide and angiotensin II thus showing great therapeutic potential for hypertension.

Conflict of Interest

The authors declare that no conflict of interest exists with respect to this work.

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