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Effect of Ethanol Seed Extract of *Coriandrum sativum* on Kerosene Mediated Oxidative Stress Markers in Wistar Rats Fed with Kerosene Contaminated Diet

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Abstract

This study was aimed at determining the effect of ethanol seed extract of *Coriandrum sativum* on kerosene mediated oxidative stress markers in Wistar rats fed with kerosene contaminated diet. *C. sativum* were bought, processed and extracted using ethanol and the extract was used in determination of phytochemical compositions, *in vitro* antioxidant properties and in treatment of rat feed with kerosene contaminated feed. Phytochemical compositions was determined using Gas Chromatography Flame Ionization Detection (GC-FID) while the *in vitro* antioxidants capacity was determined using 2,2 Diphenyl picryl hydrazyl radical, hydroxyl radical and ferric reducing antioxidant potential assays. Animal study was carried out using 43 rats separated in five groups. While group 1 and two were controls, group 3 was negative control (untreated) and groups 4 and 5 were treated groups. The acute toxicity was determined using lorke's method while oxidative stress markers malondialdehyde (MDA), superoxide dismutase (SOD) and Catalase (CAT) were determined using biochemical standard methods after 28 days of administration of the extract. The result of the study showed that the most abundant phytochemicals present ranked in the order flavonones > Ribalinidine > Aphylidine > catechin > anthocynin > phytate and others while sapogenin was the least. *In vitro* antioxidant study showed that ethanol seed extract was able to inhibit the formation of DPPH radicals and quench hydroxyl radicals with effective concentration (EC_{50}) of 1.25 and 1.35 respectively. While kerosene contaminated diet increased MDA in group 3 rats (untreated) compared to normal control (group 1), *C. sativum* extract decreased MDA in group 4 and 5. CAT activity in group 3 (untreated) was low compared to normal control while the extract increased CAT activities in groups 4 and 5. This findings revealed that seed extract of *C. sativum* is rich in antioxidant and therefore has mitigating effect on kerosene mediated oxidative stress.

Keywords: *Oxidative Stress, antioxidants, Kerosene, Coriander sativum, Phytochemicals.*

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Introduction

Kerosene is widely used as a domestic fuel in many developing regions, leading to significant exposure among populations who rely on it for cooking and heating. However, kerosene is known to contain harmful hydrocarbons that can induce oxidative stress, which is characterized by an overproduction of reactive oxygen species (ROS) and a subsequent imbalance in the body's antioxidant defenses (Halliwell & Gutteridge, 1999). This oxidative stress has been linked to a variety of health issues, including liver dysfunction, neurotoxicity, and other chronic conditions (Sies, 1991). The adverse effects of kerosene exposure are particularly concerning in vulnerable populations, such as children and individuals with pre-existing health conditions. In this context, there is growing interest in the potential of dietary antioxidants to counteract the effects of environmental toxins. *Coriandrum sativum*, commonly known as coriander, has demonstrated significant antioxidant properties in various studies, suggesting its potential as a protective agent against oxidative stress (Arora *et al.,* 2009; Bhandari & Nema, 2013). The ethanol extract of *C. sativum*

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has been shown to effectively scavenge free radicals and reduce oxidative damage in biological systems (Bhandari *et al.,* 2013). However, limited research has focused on the specific effects of *C. sativum* in the context of kerosene-induced oxidative stress. This study is aimed to investigate the protective effects of ethanol extract of *C. sativum* on oxidative stress induced by a kerosene-contaminated diet in Wistar rats. This research seeks to clarify the potential role of *C. sativum* as a natural antioxidant and its applicability in mitigating health risks associated with kerosene exposure.

Materials and Methods

Reagents and Chemicals

All chemicals and reagents used were of pure and analytical grade and products of British Drug House (BDH), England; May and Baker, England; Sigma Aldrich, USA; Central Drug House (CDH), India and Mylan pharmaceuticals, United States.

Plant Material

Coriandrum sativum seeds were bought from Awka shopping mall Awka Anambra state, Nigeria and identified and Authenticated by Prof G.C Ukpaka a taxonomist in the Department of Biological Sciences Chukwuemeka Odumegwu Ojukwu University, Anambra State. The samples were ground to powder using a blender and kept in airtight container at room temperature while two litres of kerosene were bought using two litres plastic container from fuel station in Awka

Experimental Animal:

Apparently healthy forty three (43) male Wistar albino rats of nine weeks old were obtained from Chris Farm, Mgbakwu, Awka in Anambra state. Where they were housed for this study.

Formulation of Kerosene Contaminated Feed

Growers mesh feed was contaminated with kerosene by measuring 100g of feed and mixed thoroughly with 10mls of kerosene. This was made into small pellets and were allowed to air dry for three days and was stored in air tight container prior to experimental studies-

Extraction of Plant Samples

Plant Material

Coriandrum sativum samples were washed and dried at room temperature, and ground to powder using corona manual grinding machine. The powder obtained were used to prepare the extract. The 500g of the powdered seeds were weighed with electrical weighing balance into sterile conical flask and soaked with a sufficient volume of 96% ethanol and distilled water for extraction. The sample was stirred for 2hrs interval and was allowed to extract for 48hrs, after 48hrs the samples were sieved with muslin cloth and filtered using Whatman filter paper. The filtrate was concentrated at 50ºC and then stored in air-tight sample bottle in the refrigerator for use.

Phytochemical Analysis

Gas Chromatography-flame ionization detector (GC-FID)was used for identification and quantification of phytochemical constituents as reported by Nwiloh *et al.* (2016). *C. sativum* seeds were crushed in a container for the GC-FID analysis, and 1g of the crushed sample was weighed and put into a test tube. The test tube containing the crushed seed was filled with 15 ml of ethanol and 10 ml of 50% w/v potassium hydroxide. The test tube was kept for sixty minutes in a water bath set at 60ºC. The test tube's contents were then cautiously transferred into a separatory funnel, and the tube was rinsed with 10 ml of cold water, 10 ml of hot water, 20 ml of ethanol, and 3 ml of hexane in the same funnel. Beside, 10ml of a 10% v/v ethanol solution was used to wash the extract in the test tube three times. After that, the solvent was evaporated and the extracted solution was dried using anhydrous sodium sulphate. After solubilizing a sample of the extract in 100µl of pyridine, 20µl was put into a vial on the Gas Chromatography machine to be subjected to phytochemical analysis. A flame ionisation detector (FID)-equipped BUCK M910 Gas Chromatograph (GC) (BUCK Scientific, USA) was used to conduct the GC-FID phytochemical analysis. Utilized was a 15-meter RESTEK MXT-1 column (15 m x 250 µm x 0.15 µm). The injector was set at 280 degrees Celsius, with a splitless injection of 2 microliters of sample and a linear velocity of 30 cm/s. The carrier gas used was helium 5.0 Pas, flowing at a rate of 40 ml per minute. Initially operating at 200 ºC, the oven was heated to 330 ºC at a rate of 3 ºC min-1 and maintained at 320 ºC. The ratio of the detected phytochemicals' area to the area and mass of the internal standard was used to determine the phytochemicals.

In vitro Antioxidant Activity Assay

DPPH (2,2 Diphenyl 2-picryl hydrazine) Assay

The DPPH radical scavenging activity assay were performed according to the method described by Molyneux (2004). The absorbance lowers when antioxidants react with 2,2 Diphenyl 2- Picryl Hydrazyl (DPPH) and turn it into 1,1 Diphenyl 2-Picryl Hydrazine (DPPH-H). The degree of discoloration demonstrates the extract's antioxidant components' power to donate hydrogen while scavenging free radicals. The mixture contained 2.0 ml ethanol seed extract of *C. sativum* combined with 1 ml of 3 mM DPPH in methanol at doses ranging from 62.50 to 500.00 µg/ml. After giving the combination a good shake, the mixture was left to remain at room temperature in the dark for 30 minutes. The negative control was 1.0 ml of 3mM DPPH in methanol, whereas 1.0 ml of methanol was used as the blank solution. The reference standard utilized was L-ascorbic acid. At 517 nm, the assay mixture's absorbance was measured and the percentage inhibition of DPPH was calculated thus:

% inhibition of DPPH = Abs control -Abs sample /abs of sample × 100
Where Abs = absorbance.

Ferric Reducing Antioxidant Power Assay (FRAP)

Ferric ions reducing power was measured according to the method of Oyaizu (1986).The ferric reducing antioxidant power (FRAP) approach relies on an antioxidant that donates electrons to reduce a colourless ferric complex to an intensely blue ferrous complex at low pH. The mixture contained 2.5 ml of 20 mM phosphate buffer and 2.5 ml of 1 percent, w/v potassium ferricyanide and different concentrations of ethanol

seed extract of coriander, and was incubated at 50 °C for 30 min. The mixtures were then added 2.5 ml of 10 percent (w/v) trichloroacetic acid and 0.5 ml of 10 percent (w/v) ferric chloride, and were left to stand for 10 min. At 700 nm, the absorbance was finally measured against the reference standard Gallic acid.

Hydroxyl Radical Scavenging Activity Assay

Hydroxyl radicals scavenging activity was measured by the method of Kunchandy and Rao (1990)**.** When salicylate is subjected to the fenton reaction, the main products are 2, 3-dihydrobenzoate, 2, 4-dihydrobenzoate, and 2, 5-dihydrobenzoate. Beers law evaluating the additiveness of the hydroxybenzoate absorbances may be used to identify and quantify the hydroxylated compounds. The reaction mixture contained 50 ml of (8.0 mM), Fecl3, 80 ml of H_2O_2, and 50 ml of distilled water, 14 ml of 20 mM salicylic acid and various concentrations of ethanol seed extracts of *C. sativum*, ranging from 15.63 to 250 g/ml, were added. After 30 minutes of incubation, the solutions were examined at 510 nm for absorbance. The percentage inhibition was determined by comparing the absorbance value of test and control at 532 nm.

Scavenging activity (%) = Abs of control - Abs of sample / Abs of control × 100

Where Abs = Absorbance

Acute Toxicity Studies: (Lethal Median Dose (LD_{50}))

The method of Lorke (1983) was adopted for the acute toxicity test of the ethanol extracts of *C.sativum* seed. Thirteen (13) male wistar albino rats were utilized in this study. The test were in two phases:

a. In phase one, the animals were grouped into three (3) groups of three rats each and were given 10mg/kgbw, 100mg/kgbw and 1000mg/kgbw of the extracts respectively.
b. The second phase involved the administration of 2000mg/kgbw, 4000mg/kgbw and 5000mg/kgbw to three(3)groups of (1) one rat each. After administration, the rats in phase one and phase two were observed within the first 24hours for signs of toxicity.

Calculation of $LD_{50} = \sqrt{(Do \times D100)}$.

Where Do=Highest dose that gave no mortality

D100= Lowest dose that produced mortality

Animal study / Experimental Design:

In this study, 43 rats were obtained from Chris Farm Awka.The rats were acclimatized for seven days before treatment commenced. At the end of the acclimatization, out of the 43 rats, 13 were used for acute toxicity test while 30 were divided into five groups of 6 rats each according to diet and treatment administered to them.The rats were housed in cages (six per cage) under room temperature condition of 25^0C with 12hours light and dark cycle. They were fed with growers mesh and water ad *libitum*. The animals were grouped as follows: Group 1 (Normal control) was given standard feed and water ad *libitum*, group 2 (positive control) was given standard feed, 200mg/kg b.w of ethanol extract of Coriander seed and water, group 3 (negative control untreated) was given kerosene contaminated feed and water, Group 4 was fed with kerosene contaminated diet, 200mg/kg Coriander seed extract and water while group 5 was fed with kerosene contaminated diet, 400mg/kgb.w Coriander seed extract and water. Administration of extracts were done by oral gavage. All treatment was given daily for twenty eight (28days).

The initial weight of the rats in each of the groups were taken at beginning of the experiment and weekly for four weeks using weighing balance and changes in mean body weight of rats in each of the groups was determined at the end of the experiment**.** At the end of the study the animals were sacrificed on day 28 by cervical dislocation after anesthesia using chloroform and blood samples was collected using a 5ml syringe through cardiac puncture.into plain centrifuge tubes and then allowed to stand for an hour. Serum was prepared by centrifugation at 3000 rpm for 5min with a centrifuge. The clear supernatant was used for further studies.

Treatment of various groups were shown below:

Group 1 = Rat chaws + water (Normal control)

Group 2 = Rat chaws + 200mg/kgb.w Coriander seed extract + water (Positive control)

Group 3 = Kerosene contaminated diet + water (Negative control

Group 4= kerosene contaminated diet + 200mg/kgb.w of ethanol seed extract of C.sativum + water

Group 5 = kerosene contaminated diet + 400mg/kgb.w of ethanol seed extract of C.sativum + water

Ethical Consideration: All experimental protocols were conducted according to the guidelines for the care and handling of experimental animals. The animals received human care according to the principles of laboratory animal care of the National Society of Medical research and in accordance with the principle of laboratory animal care as reported by (Akah *et al*., 2009).

Lipid Peroxidation (Estimation of Malondialdehyde Level)

MDA levels, an index of lipid peroxidation were measured by the double-heating method of Ohkawa *et al*. (1979). This method is based on spectrophotometric measurement of the purple color generated by the reaction of TBA with MDA. For this purpose, 2.5 mL of trichloroacetic acid solution (10%w/v) was added to 0.5 mL of homogenized tissue in each centrifuge tube; the tubes were then placed in a boiling water bath for 15 minutes. After cooling to room temperature, the tubes were centrifuged at 1000xg for 10mins and 2mL of each sample supernatant was transferred to a test tube containing 1 mL of TBA solution (0.67% w/v). Each tube was then placed in a boiling water bath for 15 minutes. After cooling at room temperature, the absorbance was read at 532 nm using spectrophotometer.

Estimation of Superoxide Dismutase Activity (SOD)

Superoxide dismutase (SOD) activity was assayed by the nitro blue tetrazolium (NBT) method as described by Beauchamp *et al*. (1971). In this method, the reaction mixture consists of 0.5ml supernatant, 1ml of 50mM Sodium carbonate, 0.4ml of 25µM NBT, 0.2ml of 0.1mM EDTA. The action is then initiated by the addition of 0.4ml of 1mM hydroxylamine hydrochloride. The change in absorbance is recorded at 560

nm using a UV spectrophotometer. The control is simultaneously run without homogenate. Units of SOD activity are expressed as the amount of enzyme required to inhibit the reduction of NBT by 50%. Specific activity of total SOD is expressed as units per milligram protein.

$$SOD = \frac{ODsample \times 100 \times 10^6}{4020} \div protein\ content$$

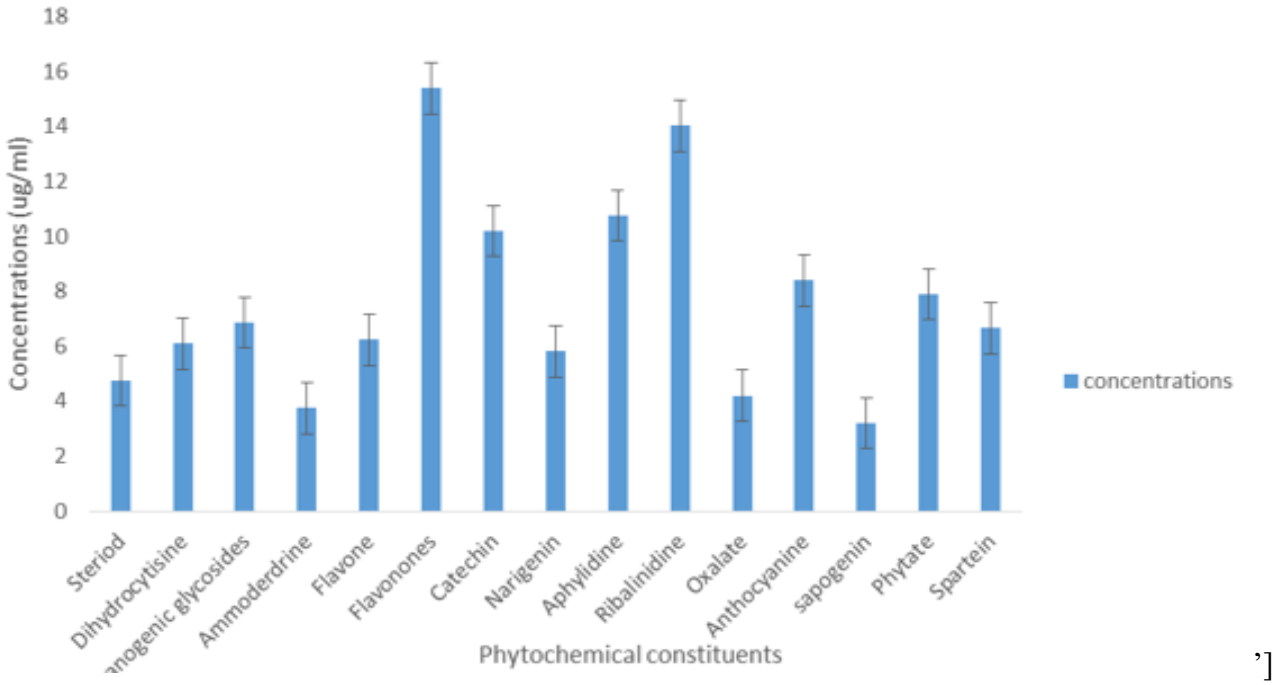
Estimation of Catalase Activity (CAT)

Catalase (CAT) activity was determined by catalytic reduction of hydrogen peroxide using a standard method described by Aebi (1984). The mixture consists of 1.95 ml of phosphate buffer (0.05 M, pH- 7), 1 ml of H_2O_2 (0.019 M) and 0.05 ml sample (10% w/v) in a final volume of 3 ml. The control cuvette contains all the components except the substrate. Change in absorbance is then recorded at 240 nm and the results were expressed as micromoles of product formed per minute per milligram protein of the tissue.

$$CAT = \frac{ODsample \times 15 \times 10^3}{40} \div protein\ content$$

Results and Discussion

The result of phytochemical composition of *C. sativum* (fig 1) showed that flavonones was highest (15.38±0.02µg/ml) followed by Ribalinidine (14.02±0.01µg/ml) and least was sapogenin (3.20±0.02µg/ml). Generally there were fifteen different phytochemical constituents present in *C. sativum* but the six most abundant of them were ranked thus Flavonone > Rabalindine > Aphylidine > Catachin > Anthocyanin > Phytate. Antioxidant activity of *C. sativum* is a function of its bioactive compounds especially its phytochemical composition due to their redox properties by mopping up free radicals and quenching singlet oxygen. Ramadan *et al.* (2003) reported on positive relationship between free radical scavenging activity and polyphenol content of the seed extract of *C. sativum*. Deepa and Anuradha (2010) reported that the antioxidant properties of *C. sativum* could be linked directly to both scavenging activity against ROS and elevation of antioxidant status.



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Figure 1: Phytochemical compositions of ethanol seed extract of *C. sativum*

The free radical scavenging capacity of ethanol seed extract of *C. sativum* (Table 1) showed that 2,2 diphenyl picrylhydrazyl (DPPH) radicals were effectively scavenged at various concentrations. The inhibition of DPPH radical formation by the extract was concentration dependent. The % inhibition was highest at 500µg/ml but this was lower compared to the ascorbic acid standard and the effective concentration at which DPPH radical was scavenged by 50% (EC_{50}) was inversely proportional to the radical scavenging activity of the sample. The EC_{50} of the seed extract of *C. sativum* was higher (1.25±0.02) compared to EC_{50} of ascorbic acid standard (1.15±0.01). This indicated that ascorbic acid had higher DPPH scavenging potential compared to *C. sativum* seed extract. DPPH is a stable free radical which has been widely accepted as a tool for estimating the free radical scavenging capacity of antioxidant (Deepa and Anuradha, 2010). However, ethanol extract of *C. sativum* at varying concentration reduces Diphenyl picryl hydrazyl radical to hydrazine by transfer of electron or hydrogen atom (Maduakor *et al.*, 2021).

The hydroxyl radical scavenging potential of ethanol seed extract of *C. sativum* (Table 2) indicated that percentage inhibition increases with increase in the concentration of the

extract. However, the EC_{50} of the extract (1.35±0.01) was higher compared to ascorbic acid standard (1.14±0.00) which showed that ascorbic acid standard has a higher hydroxyl radical scavenging activity compared to *C. sativum* seed extract. Hydroxyl radical (OH-) are reactive oxygen species capable of oxidizing biomolecules. They are by-products of many degenerative reactions in many tissues which may affect regular metabolism by damaging the cellular components (Egbuna and Ifemeje, 2017). The harmful effects of hydroxyl radicals include DNA damage, lipid peroxidation, amino acid and protein oxidation and inactivation of some enzymes due to oxidation of their cofactors (Egbuna and Ifemeje 2017).

This same trend was observed in ferric reducing antioxidant potential assay (Table 3). Ferric ion (Fe^{3+}) was reduced by electron donating antioxidant present in the extract to ferrous form (Fe^{2+}). The percentage inhibition increased with increase in concentration of the seed extract showing that the activity of the extract is concentration dependent and the result is similar when compared with ascorbic acid standard which Nnanyelugo *et al*. (2021) affirms as a reference standard when comparing antioxidant potential of plant extract. Meyer *et al.*, (2019) also reported that the Lower the EC_{50} value of an extract, the more potent it's antioxidant activity or its capacity in inhibiting the target activity.

Table 1: DPPH Radical Scavenging Assay of Ethanol Extract of Coriander Seeds

Concentrations	**% Inhibition**	**Standard**
(µg/ml)	***C. sativum***	**Ascorbic acid (mg/ml)**
62.50	82.69±0.03[b]	84.19±0.02[a]
125.00	66.53±0.01[b]	88.64±0.02[a]
250.00	85.28±0.01[a]	91.43±0.02[b]
500.00	88.40±0.02[a]	94.21±0.01[b]
Ec_{50}	1.25±0.01[a]	1.15±0.02[a]

Values are means ± standard deviation of triplicate determination. Values within the same row bearing the same superscript letters are not significantly at p<0.05.

Table 2: Hydroxyl radical scavenging assay of ethanol extract of coriander seeds

Concentrations	**% Inhibition**	**Standard**
(µg/ml)	***C. sativum***	**Ascorbic acid (mg/ml)**
62.50	70..67±0.03[b]	73.22±0.02[a]
125.00	82.49±0.02[b]	85.98±0.02[a]
250.00	83.41±0.02[b]	89.84±0.03[a]
500.00	85.25±0.01[a]	89.92±0.02[b]
Ec_{50}	1.35±0.01[a]	1.14±0.01[b]

Values are means ± standard deviation of triplicate determination. Values within the same row bearing the same superscript letters are not significantly at p<0.05.

Table 3: Ferric reducing antioxidant power (FRAP) of ethanol extract of coriander seeds

Concentrations	**% Inhibition**	**Standard**
(µg/ml)	***C. sativum***	**Gallic Acid(mg/ml)**
62.50	0.73±0.01[b]	0.82±0.00[a]
125.00	0.89±0.00[b]	1.02±0.01[a]
250.00	0.94±0.01[b]	1.10±0.00[a]
500.00	1.44±0.02[b]	1.73±0.01[a]

Values are means ± standard deviation of triplicate determination. Values within the same row bearing the same superscript letters are not significantly at p<0.05.

The acute toxicity of the seed extract of *C. sativum* (Table 4) showed that oral administration of ethanol seed extract of *C. sativum* to Wistar rats has no observable sign of toxicity at low to high doses (10 -5000mg/kg) within 24hrs of exposure. This signified that the extract has no sign of toxicity with the administered doses and that Lethal doses (LD_{50}) of the extract may be above 500mg/kgb.w.

Table 4: Result of acute toxicity (LD_{50}) of Low and high doses of ethanol extract of *C. sativum* in Wistar rats.

Dose Extract (Mg/kg) of *C. sativum*	**Mortality**	**Observation**
10	0/3	Normal
100	0/3	Norma
1000	0/3	Normal
2000	0/1	Normal
4000	0/1	Normal
5000	0/1	Palpitation

There were observable changes in mean body weight of Wistar rat during the experimental study (Fig. 2). It was observed that the mean body weight fed with normal rat chaws and water (group 1) increased as the week progressed while the mean body weight of rat fed with kerosene contaminated feed (negative control) without treatment decreased as the week progressed. This may be attributed to oxidative stress triggered by reactive oxygen species from kerosene contaminated feed. The mean body weight of rats fed with contaminated feed but treated with 200mg/kg and 400mg/kg of seed extract for group 4 and 5 decreased in week one and week 2 but progressively increased from week 3 and week 4. These changes in weight during treatment could be attributable to the presence of phytochemical content of *C. sativum* which assisted in reduction of oxidative stress impacted by kerosene contaminated feed.

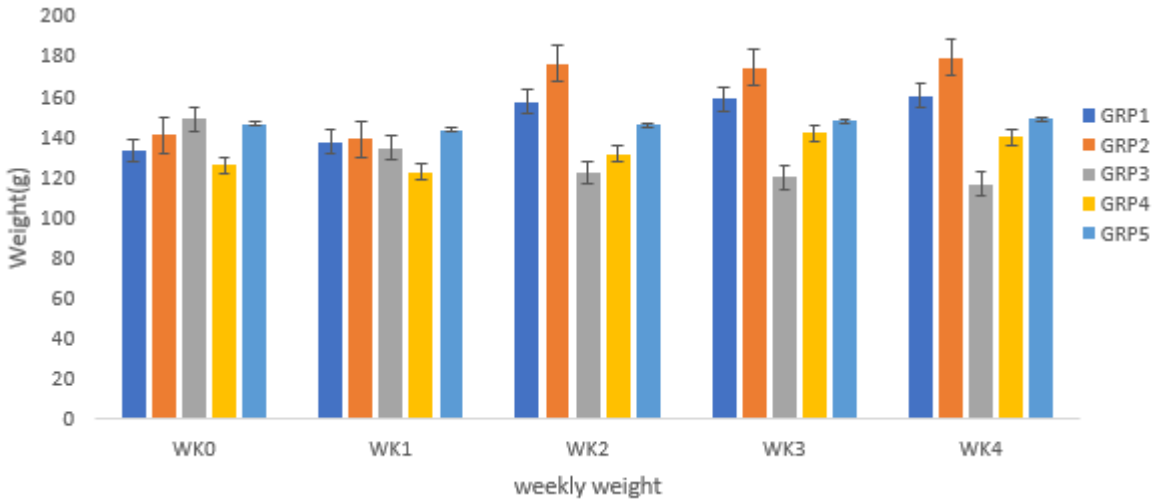


Figure 2: Effect of ethanol seed extract of *C. sativum* on changes in weight of Wistar rat in kerosene mediated oxidative stress over weeks.

The effect of ethanol seed extract of *C. sativum* on lipid peroxidation by kerosene mediated oxidative stress in wistar rat (Fig. 3) showed that serum lipid peroxidation levels was evidenced by increased formation of malondialdehyde (MDA) in group 3 rats (negative control) compared to normal control (group 1) and treated groups (groups 4 and 5). The result also indicated a significant reduction of MDA (the biomarker of lipid peroxidation) in group 5 rats treated with 400 mg/kgb.w of the extract compared to group 4 treated with 200 mg/kgb.w. This indicated that the activity of the extract was concentration dependent. Increase in MDA could be attributed to increase in free radicals. The administration of 200mg/kg and 400mg/kg of seed extract of coriander respectively significantly reduced MDA suggesting the antioxidant potential of the phytochemical components of *C. sativum* seed extract in reducing ROS generation and oxidative damage. This result is similar to the findings of Deepa and Anuradha (2010) that reported a decrease in lipid oxidation in the presence of coriander seed extract.

Also, there was a significant increase in Superoxide dismutase (SOD) activity of group 3 (negative control) compared to normal control group and treatment with 200mg/kg and 400mg/kgb.w of the extract in groups 4 and 5 respectively reduced the SOD activities. However, there was a decrease in Catalase (CAT) activity in group 3 (negative control) compared to group 1 (normal control). Treatment with 400mg/kgb.w of the extract elevated the CAT activity compared to normal (control) and negative control. This could be attributed to antioxidant capacity of *C. sativum* ethanol seed extract in reducing oxidative stress. The decrease in CAT activity could be attributable to attack on the enzyme by free radicals such as alkoyl (RO), peroxyl (RO_2) radicals and endogenous reactive species formed by kerosene contaminated diet through multiple mechanism. This may lead to negative impact of oxidative stress in biological system such as damage to proteins, enzymes and various transcriptional factors. This is in tandem with the report of Datta e*t al.* (2000) that enzymes are susceptible to free radical attack and antioxidants are very important in scavenging ROS and removal of the toxic intermediates. The elevation of CAT during treatment with 200mg/kg and 400mg/kg of seed extract of *C. sativum* may be attributable to increase in antioxidant status due to the presence of bioactive components of the seed extract. The finding is similar to observation made by Chithra and Leelamma (1999) that rats fed with high fat diet supplemented with coriander seed increased the antioxidant level in Sprague dawley female rats.

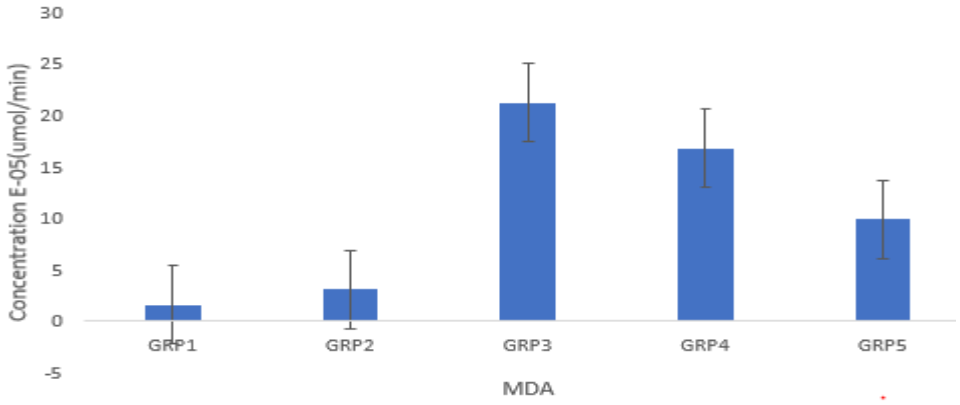


Figure 3: Effect of ethanol seed extract of *C. sativum* on lipid peroxidation by kerosene mediated oxidative stress in Wistar Rats

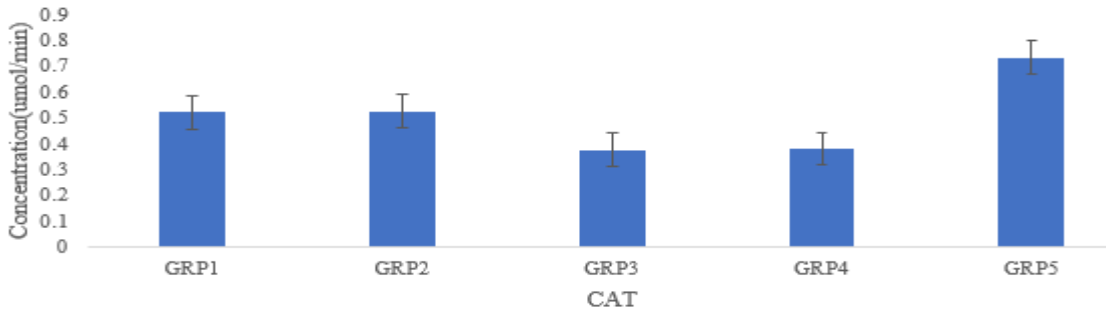


Figure 4: Effect of ethanol seed extract of *C. sativum* on catalase activity by kerosene mediated oxidative stress in Wistar rats

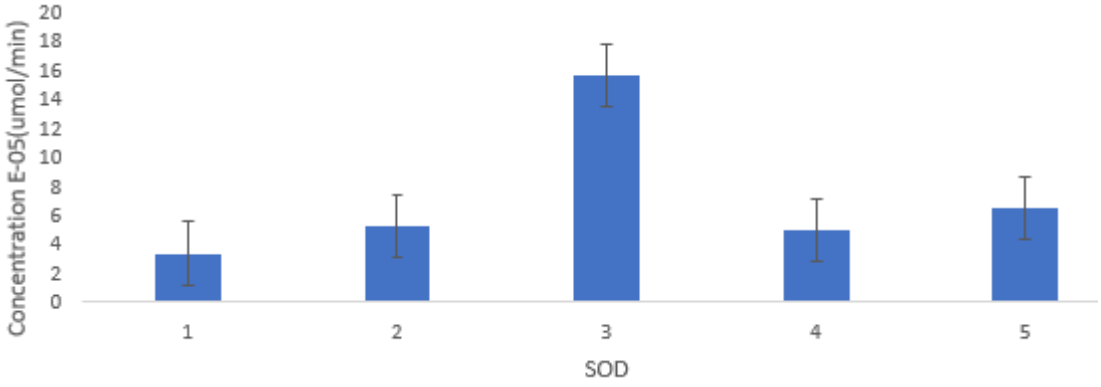


Figure 5: Effect of ethanol seed extract of *C. sativum* on superoxide dismutase activity by kerosene mediated oxidative stress in Wistar rats

Administration of *C. sativum* ethanol seed extract to group 2 rats has shown that *C. sativum* could confer protective impact on the rats by scavenging free radicals that may lead to oxidative stress and eventually damaging the cells. The antioxidant activity of *C. sativum* generally decreases the level of oxidation by transferring the hydrogen atoms of the free radicals to form more stable components that may terminate the radical chain reaction (Kitzuru *et al.*, 2004). Therefore the bioactive compounds of *C. sativum* seed extract could be implicated in ameliorating the impact of kerosene contaminated diet on oxidative stress markers of Wistar rats.

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Conclusion

The present study has revealed the antioxidant properties and free radical scavenging potentials of *C. sativum*. The ethanol extract of *C. sativum* seed has shown the presence of Flavonone, Rabalindine, Aphylidine, Catachin, Anthocyanin, Phytate and other bioactive compounds with antioxidant capacity of scavenging free radical thereby reducing oxidative stress markers in rats fed with kerosene contaminated diet. This therefore implies that ethanol seed extract of *C. sativum* has the potential of mitigating oxidative stress in rats fed with kerosene contaminated diet.

References

Aebi, H (1984): Catalase in vitro. *Methods Enzymology***105**,121-126

Arora, D. S., Kaur, J., & Kaur, G. (2009). Antioxidant activity of coriander (*Coriandrum sativum*) extracts. *Food Chemistry*, **114**(3), 862-868.

Akah, P.A.,Alemji, J.A., Salawu,O.A., Okoye,T.C and Offia N.V (2009): Effect of Vernonia amygdalina on Biochemical and Hematological parameters in diabetic Rats. Asian Journal of Medical Sciences **1**(3):108-113,

Beauchamp and Fridovich (1971): Superoxide dismutase: Improved assays and an assay applicable to acrylamide gels. *Anal. Biochem*, **44** (1)276-287

Bhandari, U., & Nema, R. K. (2013). Antioxidant potential of coriander seeds (*Coriandrum sativum* L.). *International Journal of Food Properties*, **16**(4), 768-778.

Chithra,V and Leelamma S (1999): Coriandrum sativum changes the levels of lipid peroxides and activity of antioxidant enzymes in experimental animals. *Indian J.Biochem Biophy*, 36:59

Datta, K., Sinha,S.,and Chattopadhyay, P (2000): reactive oxygen species in health and Disease *Natl. Med J.India* 13:304

Deepa, B and Anuradha (2010): Antioxidant potentials of *Coriandrum sativum* L.seed extract. *Indian Journal of Experimental Biology*, **49**:30-38.

Egbuna,C and Ifemeje, J.C (2017): Oxidative Stress and Nutrition. T*ropical Journal of applied Natural Sciences* **2**(1):110-16

Halliwell, B., & Gutteridge, J. M. C. (1999). Free Radicals in Biology and Medicine. Oxford University Press.

Jiang,Z.Y., Hunt, J.V and Wolf,S.P (1992): Detection of Lipid peroxides using the fox method. *Anal Biochem* 202:384

Kitazuru, E.R., Moreriac, A.V.B., Mancini-filhoj.,Delinceed H and VillavicencioA(2004): Effect of irradiation on natural antioxidants in cinnnamon (cinnamonium zeylanicum N) *Radiat.phys chem* 71

Kunchandy,E., and Rao, M.N.A (1990) Oxygen radical scavenging activity of curcumin: International *Journal of Pharmaceutics:* **58**(3)237-240

eLORKE D (1983). A new approach to practical acute toxicity testing. Arch. Toxicol 54: 275-278.

Maduako, M.C., Ifemeje, J.C., Amaefule, K.I., Okechukwu, A.U and Enemchukwu, C.N (2021): Comparative study of proximate composition, antioxidant vitamins and mineral profiles of six

local wild fruits consumed in southeastern Nigeria. *Biokemistri* **33**(4) 249-258

Melo, E.A., Filho, J.M and Guerra, N.B. (2005). Characterization of antioxidant compounds in aqueous coriander extract. Lebensenmittcl Wissenshaft Tech; 38: 15-19.

Molyneux, P., (2004). "The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity". *Songklanakarin J. sci. technol, 26*(2), pp.211-219

Nnanyelugo, E.C., Ifemeje, J.C., Amaefule, K.I., Ifemeje, M.O., Ibeneme, E.M., Uhama, K.C and Maduako, M.C (2021) Comparative studies of phytochemical contents and antioxidant potentials of selected nuts consumed in eastern parts of Nigeria. *International Journal of Bioscience and Biochemistry* **3**(2) 10-15

Nwiloh, B.I.,Uwakwe,A.A and Akaninwor, J.O (2016): Phytochemical screening and GC-FID analysis of ethanolic extract of root bark of *Salacia nitida* L. Benth. *J Med Plants Stud:* **4**(6):283-287.

Ohkawa, H., Ohishi, N and Yagi, K (1979) Assay for lipid peroxides in animal tissues by Thiobarbituric acid reaction. *Analytical Biochemistry* **95** (2)351-358

Oyaizu, M (1986): Studies on product browning reaction prepared from glucosamine *Jap J.* 44: 307

Ramadan, F., Kroh, W and Morsel, T (2003): Radical scavenging activity of black cumin (Nigella sativa L) Coriander (Corianderum sativum) and Niger (Guizotia abyssinica cass) crude seed oils and oil fractions *J.Agric food chain* **51**:6969

Sies, H. (1991). Oxidative stress: from basic research to clinical application. *The American Journal of Medicine,* **91**(3C), 31S-38S.Sies, H. (1991). Oxidative stress: from basic research to clinical application. *The American Journal of Medicine,* **91**(3C), 31S-38S.

Wong PYY, Kitts DD.(2006) Studies on the dual antioxidant and antibacterial properties of parsley and cilantro extract. Food Chem **97**: 505- 515.

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