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Effect of Ethanol Extract of *Corianderum sativum* Seed on Haematologic and Lipid Profile of Wistar Rats Fed with Kerosene Contaminated Diet

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ABSTRACT

The bioactive compounds in plants are responsible for their natural antioxidant activity, and the majority of these bioactive compounds are natural phenols or polyphenols found in leaves, fruits, seeds, and flowers of plants such as *Coriandium sativum.* This study was aimed at investigating the effect of ethanol extract of *Coriandium sativum* seed (*C.sativum*) on haematologic and lipid profile of wistar rats fed with kerosene contaminated diet. *C.sativum* seed (1kg) was purchased and processed for proximate, phytochemicals composition and for animal studies. Proximate composition was determined by Association of analytical chemist methods, phytochemical was determined using Gas chromatography equipped with flame ionization detector (Gas-FID) and animal study were carried out using forty- three (43) rats obtained from Chris Farm Awka. The rats were acclimatized for seven days before treatment commenced. At the end of the acclimatization,13 rats were used for acute toxicity test while 30 were divided into five groups of 6 rats each. While group 1 and two were controls, group 3 was negative control (untreated) and groups 4 and 5 were treated groups. After 28days of treatment, the rats were anaesthesiased and sacrificed after overnight fasting and blood samples were collected by cardiac puncture using 15mls syringe. The acute toxicity was determined using lorke's method, haematological analysis was carried out using automated hematology analyzer and lipid profile was determined using Randox test kit. The result of the proximate composition showed that coriander seed contain high carbohydrate content (38.25± 0.02%), crude fat (27.67±0.01%) and crude protein (20.58±0.02%). The phytochemical constituents of the seed extract were in the order flavones (15.38±0.03 µg/ml) > Ribalinidine (14.02±0.01 µg/ml) > catechin (10.18±0.02 µg/ml). The result of the animal study showed that administration of *C sativum* extract at higher dose did not result to any mortality nor signs of toxicity. There were observable changes in mean body weight of wistar rats during the experimental study. There was significant increase in RBC ($7.93\pm0.537x10^7$/L)

and platelets (711±50.8 x10^9/L) in groups 2 and 5 (8.16±0.19x10^9/L) compared to untreated group 3 (4.36±1.98 x10^9/L). There was significant decrease in triglycerides, total cholesterol and low-density lipoprotein (LDL) in positive control (group 2) and treated groups (groups 4 and 5) compared to untreated group (3). However, there was an increase in high density lipoprotein (HDL) in the said groups compared to untreated group 3. These results indicated that *C,sativum* seed extract possess antioxidant properties, antilipidemic properties and may help mitigate the effect of kerosene contaminated feed on haematologic and lipid profile of wistar rats.

Key Works: *Coriandum sativum*, phytochemical Analysis, Haematological Analysis, Lipid profile

INTRODUCTION

Coriandrum is a genus in the family Apiaceae containing the cultivated species Coriandrum sativum (coriander) and the wild species Coriandrum tordylium. The leaves and seeds of *Coriandrum sativum* are used in cooking. The leaves are often referred to as cilantro in North America. (Terentieva *et al.,* 2015). Coriander, (*Coriandrum sativum*), is an annual plant which is used as both herb and spice. Native to the Mediterranean and Middle East regions, the plant is widely cultivated in many places worldwide for its culinary uses. Its dry fruits and seeds, which are also known as coriander, are used to flavour many foods, particularly sausages, curries, liqueurs, and confectionery. Its delicate young leaves, known as cilantro, are widely used in Latin American, Indian, and Chinese dishes.

Kerosene (synonyms: paraffin, fuel oil no.1, lamp oil) is a middle distillate of the petroleum refining process that boils between 145 and 3000C. It is a transparent liquid fuel with a mixture of hydrocarbon chains 6 to 16 carbon atoms in length. Since the mid-19th century, when it replaced the more expensive whale oil as a lighting fuel, it has become a major household, commercial, and industrial fuel used for cooking, lighting, and heating. (Lam *et al.,* 2012 cited in Maiyoh *et al.,* 2015). 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 (Ifemeje *et al.,* 2025). The principal toxicological effects arising from the exposure to ingestion of kerosene is often associated with nausea, vomiting and occasionally diarrhea. Inhalation and /or exposure to kerosene may cause headache, dizziness, drowsiness, in coordination and euphoria. Aspiration into the lungs causes pneumonitis with choking, cough, wheeze, breathlessness, cyanosis, and fever. Skin exposure to kerosene may result in dermatitis through the extraction of endogenous skin lipids. Also, acute exposure to kerosene in humans has been associated with a variety of central nervous system (CNS) effects including irritability, restlessness, ataxia, drowsiness, convulsion, coma, and death.

MATERIAL AND METHODS

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

Equipment

Equipment used were calibrated and in good working state. Some equipment used for the analysis includes: Weighing balance, muffle furnace, oven, desiccator, Kjeldahl apparatus, Soxhlet apparatus, AAS–Atomic Absorption Spectrophotometer, Spectrophotometer, GC -FID

Chemical and Reagents

The chemicals and reagents used were of analytical grade and products of Sigma (Aldrich, USA), British Drug House (BDH) (England), Harkin and Williams (England), Qualikems (India), Fluka (Germany), May and Baker (England). Reagents that were used for all the assays are commercial kits and products of Randox (USA) and Teco (USA).

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

Extraction of *Coriandrum sativum* was done as reported by (Ifemeje*, et al.,*2025). *C.sativum* (800g) 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 filterate was concentrated at 50^0C. The weight of the concentrated extract was taken and then stored in air-tight sample bottle in the refrigerator for use.

Phytochemical:

Gas Chromatography- Flame ionization detector (GC-FID) Identification and quantification of Phytochemical constituents as reported by Nwiloh *et al.,* (2016) and Ifemeje *et al.,* (2025). *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 millilitres of ethanol and 10 millilitres of 50% w/v potassium hydroxide. The test tube was left for sixty minutes in a water bath set at 60^{o}C. The test tube's contents were then cautiously transferred into a separatory funnel, and the tube was rinsed with 10 millilitres of cold water, 10 millilitres of hot water, 20 millilitres of ethanol, and 3 millilitres of hexane in the same funnel.

Also, 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 the sample of the extract in 100µl of pyridine, 20µl was introduced into a vial on the Gas Chromatography machine and was analyzed. A flame ionisation detector (FID) equipped BUCK M910 Gas Chromatograph (GC) (BUCK Scientific, USA) was used to conduct the analysis.

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 was 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 of extract, the rats were observed within 24 hours of administration for signs of toxicity.

Experimental Design

The animal study made use of 43 rats 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. The rats 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 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 b.w 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 and 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.

Heamatology:

Haematological Parameters Hb. RBC, PCV and TWBC were determined using automated haematology analyzer (mindray -BC-5300) according to manufacturer's instructions.

Lipid Profile:

The serum total cholesterol was determined spectrophotometrically using Quimica Clinica Applicada (QCA) kit according to the method described by Allain *et al., (*1974). Triglycerides were determined spectrophotometrically using Quimica Clinica Applicada (QCA) kit according to glycerol-phosphate oxidase method as described by Bucolo and David (1973). Low Density Lipoprotein - cholesterol (LDL-cholesterol) were determined using Quimica Clinica Applicada (QCA) kit according to the method described by Tietz *et al*., (1995). High Density Lipoprotein-cholesterol (HDL-cholesterol) were spectrophotometrically determined using Quimica Clinica Applicada (QCA) HDL test kit according to Dextran sulphate-Mg (II) method described by Albers *et al*., (1978). The assay procedures and wave lengths were done following instructions of the manufacturer.

Data Analysis

Data obtained were expressed as mean ±SD of three replicates. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 23. One Way Analyses of Variance were adopted for comparison, and the results were subjected to post hoc test using least square deviation (LSD). $p<0.05$ was considered significantly for all the results.

RESULTS

The proximate compositions of coriander seed as shown in figure 1 indicated the nutritional benefit of coriander seed as observed from the study; from the study, the coriander seed contained high carbohydrate (38.25± 0.02 %), crude protein (20.58±0.02%) and crude fat (27.67±0.01%,) an indication that it contained some essential oil that maybe beneficial to health which made it a good spice, it also has low moisture content 2.50±0.00% that contributes to its higher shelf-life, it also has Ash value of 8.00±0.04%.

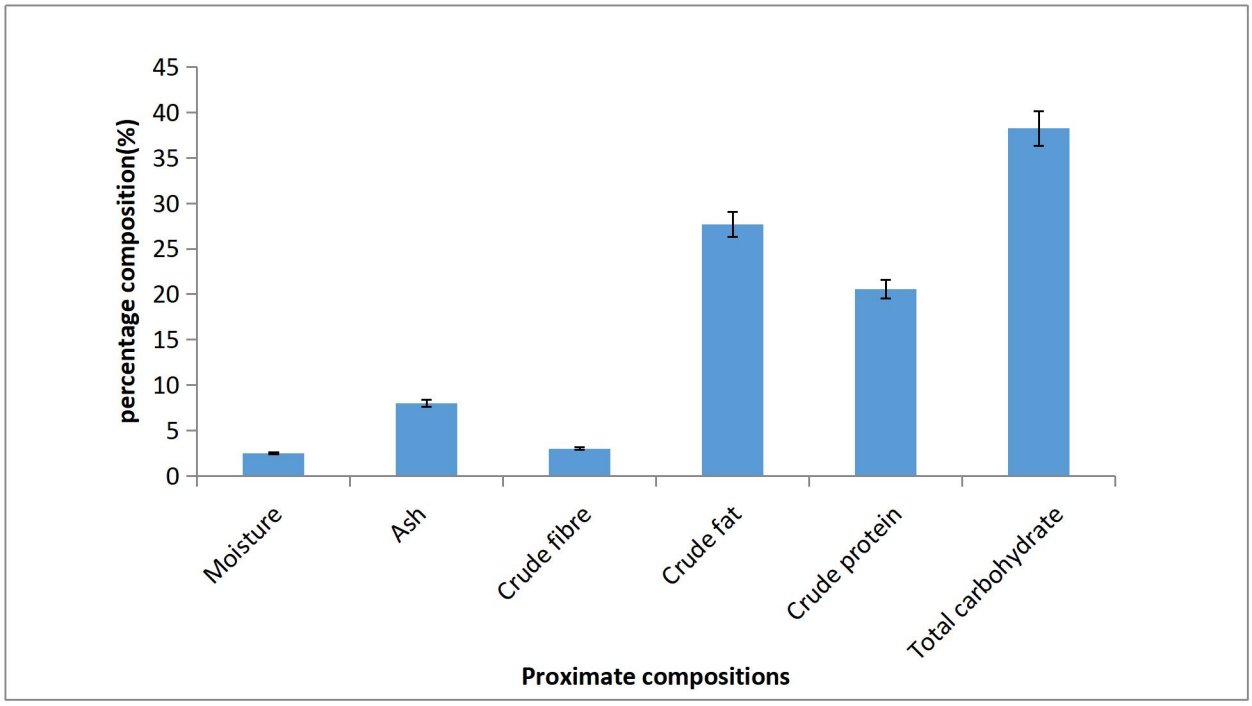

Fig 1: Proximate Compositions of Coriander Seed

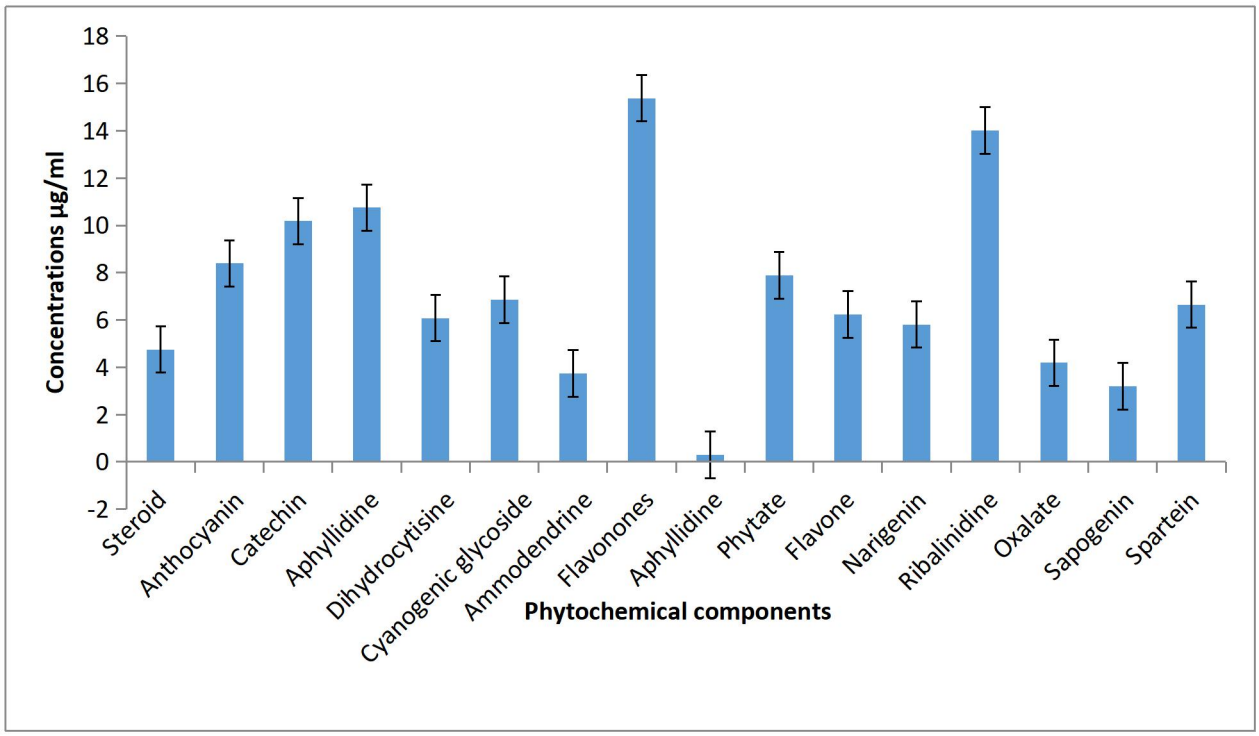

Fig 2: Phytochemical compositions of Coriander seed

Table 1: Phase 1 and II Showed the Acute Toxicity (LD_{50}) Of Coriander Seed Extract

Phase I

	Dosage (mg/kg b.w)	Number of Mortality in Coriander seed group	Behaviour
Group 1	10	0/3	Normal
Group 2	100	0/3	Normal
Group 3	1000	0/3	Normal

Phase II

	Dosage (mg/kg b.w)	Number of Mortality in Coriander seed group	Behaviour
Group 1	2000	0/3	No signs of palpitation
Group 2	4000	0/3	Palpitation
Group 3	5000	0/3	Palpitation

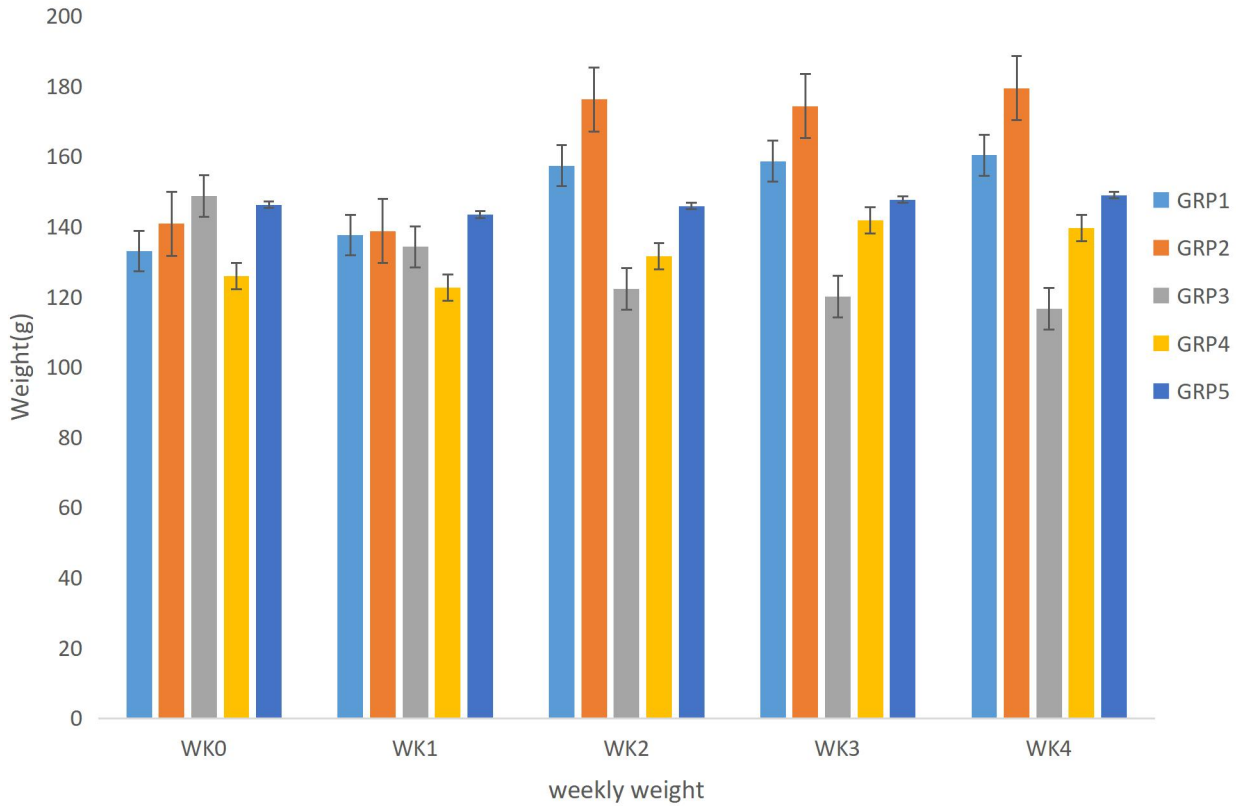

Fig 3:Effect of Ethanol extract of C.sativum on mean body weight of Albino wistar rat fed with kerosene contaminated diet.

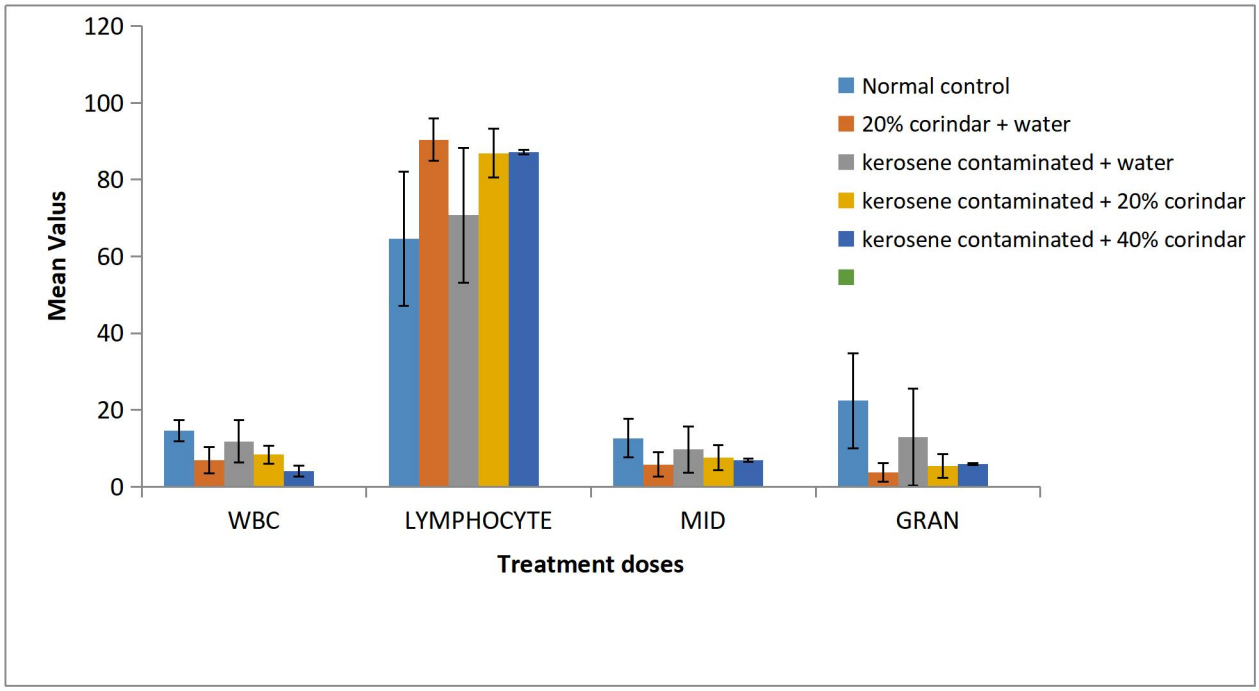

Fig 4: Effect of Ethanol extract of *C.satvum* on haematologic Profile of Differential white blood count (Lymphocyte, Monocyte and Granulocytes) of Albino Rats fed with kerosene contaminated diet.

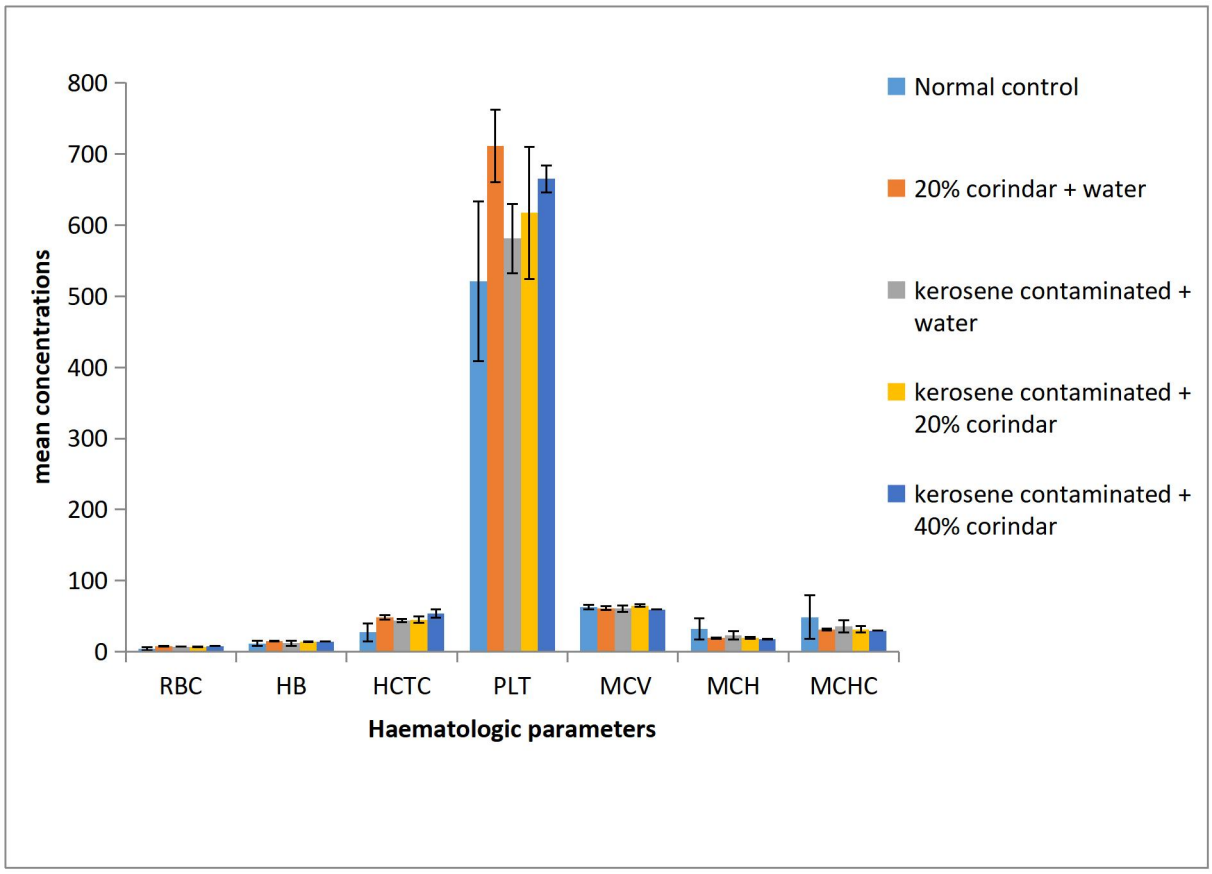

Fig 5: Effect of Ethanol extract of *C.satvum* on haematologic Profile of Red blood Cell, Hemoglobin, Hematocrit, Platelet, Mean Cell Volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration.

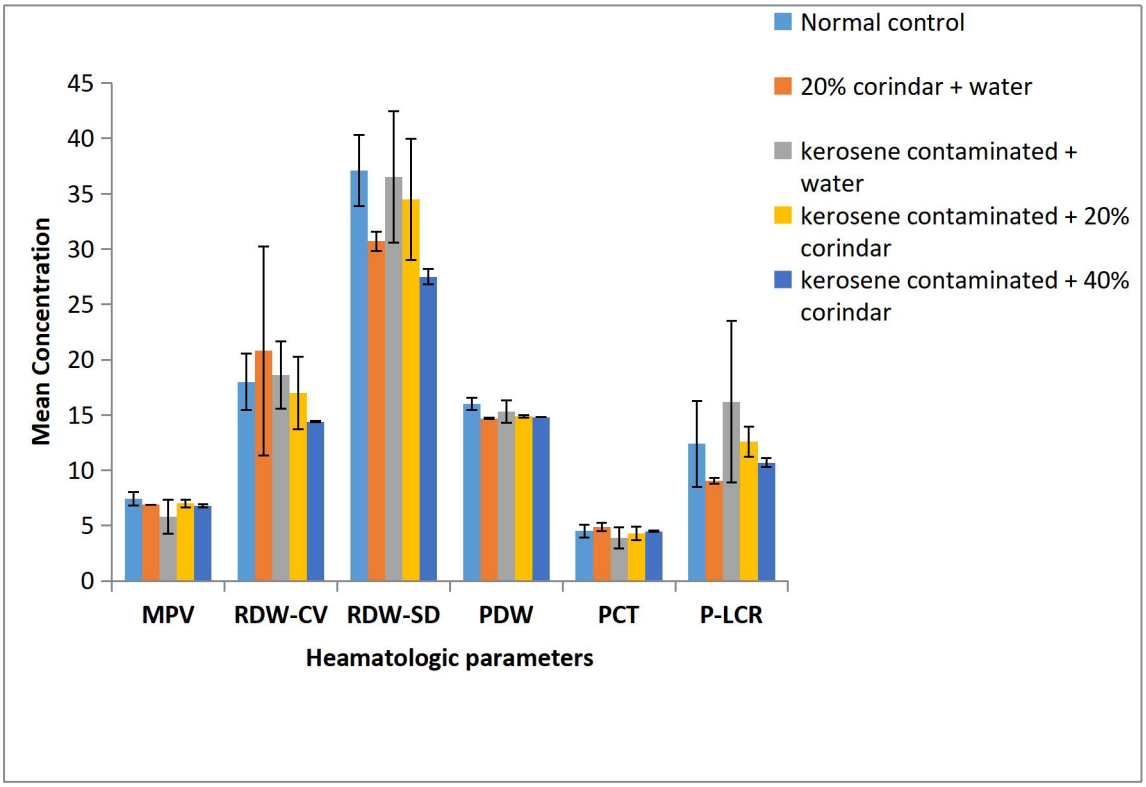

Fig 6: Effect of Ethanol extract of *C.satvum* on haematologic Profile of Mean Platelet Volume, red cell distribution width - coefficient of variation, red cell distribution width-standard deviation, Platelet Distribution Width, Platelet Crit and platelet-large cell ratio

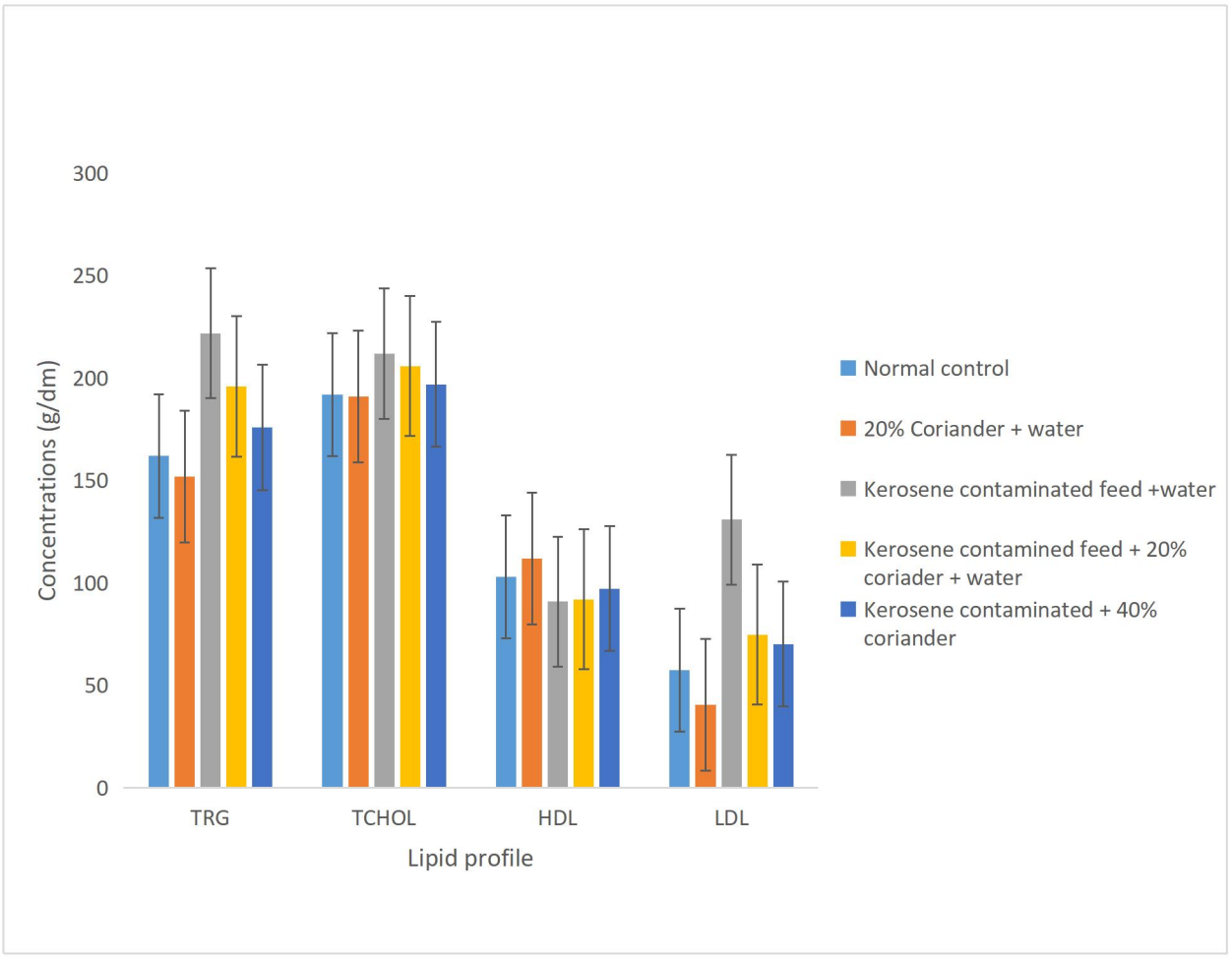

Fig 7: Effect of Ethanol extract of *C.sativum* seed on Lipid Profile of Wistar rats fed with kerosene contaminated diet.

The result of phytochemical compositions of coriander seed extract was shown in figure 2. The phytochemical analysis showed that, the seed contains 15.38±0.03µg/ml of flavones, 14.02±0.01µg/ml Ribalinidine, and 10.18±0.02µg/ml catechin. Other phytochemicals present in the seed includes steroid, phytate, tannins etc.

Acute toxicity (LD_{50}) and lethality test of *C.sativum* (Table 1) indicated no physical and behavioural change such as diarrhea, sleepiness, loss of appetite, coma or death. The rats were observed for any sign of toxicity or mortality for 24 hours at interval of 10 minutes and thereafter, after every 1 – 2hours for any sign and symptoms of toxicity. The first phase of the study, 10mg/kgbw, 100mg/kg bw and 1000mg/kgbw of the Coriander seed extracts respectively were given to the animal and there was no sign of toxicity and mortality. In the second phase, higher doses of 2000mg/kgbw, 4000mg/kgbw and 5000mg/kgbw were given to the animal yet there was no sign of mortality. The LD_{50} was thus established to be > 5000 mg/kg.

There were observable changes in mean body weight of wistar rat during the experimental study. (Fig 3). It was observed that the mean body weight of rat 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 (group 3 negative control) without treatment decreased as the week progressed. 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

The result of the Haematologic profile of Wistar rats fed with ethanol extract of *C.sativum* was shown in fig 4. The result showed slight significant in some parameters, White blood count (WBC) showed significant ($p<0.05$) reduction in groups (8.37±2.27 $x10^7$/L) and 5 (4.10±1.41 $x10^7$/L) treated with 200 mg/kg b.w and 400mg/kg b.w of ethanol seed extract of *C.sativum respectively* compared to the control group (14.6±2.80) and treated group 3 (11.8±11.8 $x10^7$/L), MID and Gran were reduced in treated groups 4 and 5 compared to untreated group 3 while lymphocyte level was higher in treated groups 4 and 5 compared to untreated group 3.

Effect of Ethanol extract of *C.satvum* on haematologic Profile of Red blood Cell was shown in fig 5. The result showed that RBC was significantly higher ($p<0.01$) in group 2 (7.93±0.537 $x10^7$/L) which was fed with 200mg/kgb.w of ethanol extract of coriander

seed and water and in group 5 (8.16±0.191 x10^7/L) fed with kerosene contaminated feed and treated with 400mg/kgb.w of ethanol extract of coriander seed compared to the control group 1 (4.36±1.98) and treated group 4 (7.20±0.0850). Hematocrit (HCTC) was significantly higher ($p<0.01$) in group 5 (53.7±5.94%) followed by group 2 (48.8±3.06%) and then group 4 (45.3±4.74%) compared to the control group (27.6±12.6). PLT was also higher in groups 2, 4 and 5 compared to the control group1 and untreated group 3. while others parameters (MCV, MCH and MCHC) did not differ significantly.

Effect of Ethanol extract of *C. satvum* on haematologic Profile of Mean Platelet Volume, red cell distribution width - coefficient of variation, red cell distribution width-standard deviation, Platelet Distribution Width, Platelet Crit and platelet-large cell ratio were shown in fig 6. The result showed that the RDW-CV, RDW-SD, PDW, PCT and P-LCR did not differ significantly ($p<0.05$) compared to the control group. However, their values were high in untreated groups compared to treated groups. While MPV and PCT were low in untreated groups compared to treated groups.

Effect of Ethanol extract of *C.sativum* seed on lipid profile of Wistar rats fed with kerosene contaminated diet was shown in fig 7. The result showed that triglycerides (TRG) was significantly reduced ($p<0.05$) in group 2, 4 and 5 (152±38.4 g/dm, 196.02±19.3 and 176.05±29.0 g/dm respectively) compared to the untreated group 3 (222±10.6 g/dm) while all others groups showed no significant difference when compared to the control group. The Total Cholesterol (TCHOL) followed the same trend as triglycerides. High Density Lipoprotein (HDL) was significantly highest ($p<0.05$) in group 2 (112.0±4.26 g/dm) followed by control (group 1) and least was group 3 (91.0±11.3 g/dm) while Low Density Lipoprotein (LDL) (131±67.4 g/dm) was highest in group 3 followed by group 4 and the least was group 2.

DISCUSSION

The chemical compounds in plants are responsible for their natural antioxidant activity, and the majority of these active compounds are natural phenols or polyphenols. Leaves, fruits, seeds, and flowers have the highest natural flavonoid and phenol contents. Increased dietary consumption of antioxidants or vegetables or fruits with antioxidant activities can improve quality of life (Siriwardhana *et al.,* 2002). The result of this study revealed the potential benefit of coriander seed. From the analysis,

the coriander seed contain high carbohydrate of about 38.25± 0.02%, 20.58±0.02% crude protein, 27.67±0.01% crude fat which showed that it contains some essential oil that maybe beneficial to health which made it a good spice, it also has low moisture content that contributes to its higher shelf-life.

The phytochemical study of ethanol extract of *C sativum* seed, revealed the abundance of some phytochemicals in the order Flavones (15.38±0.03µg/ml) > Ribalinidine (14.02±0.01µg/ml) > catechin (10.18±0.02µg/ml) that showed anti-oxidants properties that are good to health, these values are similar to the report of Hanaa *et al*., (2022). The presence of these phytochemicals may help mop free radicals and as well reduce oxidative stress impacted to the rat by kerosene contaminated feed. This finding is similar to Ramadan *et al.* (2003) who reported on the positive relationship between free radical scavenging activity and polyphenol content of 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.

The acute toxicity of the seed extract of *C.sativum* (table 5) 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.

There were observable changes in mean body weight of wistar rat during the experimental study. (Fig 3). The decrease in mean body weight observed in rats fed with kerosene contaminated diet and water (group 3) without treatment could be attributed to oxidative stress triggered by reactive oxygen species from kerosene contaminated feed while the progressive increase in weight of rat treated with 200 mg/kg b.w and 400 mg/kg b.w of extract could be as a result of antioxidant properties of the extract which helped in ameliorating the effect of the oxidative stress imposed by kerosene contaminated feed in the rats.

The Haematological profile showed less significance in some parameters, increased WBC, Middle cell count (MID) and Granulocytes (Gran) in untreated group compared to treated group and control (Fig 4) could be as a result of inflammatory response due to oxidative stress from the kerosene

contaminated feed which may trigger immune response leading to elevated levels of WBC, MID and Gran. This finding is similar to the report of Onwurah *et al.,* (2007) who associated kerosene exposure with increased generation of reactive oxygen species (ROS) leading to oxidative stress and damage to cellular macromolecules, thereby stimulating inflammatory pathways and elevated WBC. Red blood cell (RBC), Heamoglobin (Hb), Hematocrit (HCTC) and Platelets (PLT) in group 2, 4 and 5 were significantly higher compared to group 3 (fig 5) this could be attributed to oxidative stress resulting from reactive oxygen species due to ingestion of kerosene contaminated diet. However, the hematotoxic effect of the kerosene contaminated diet were mitigated in rats treated (groups 2,4 and 5) with ethanol extract of *C. sativum*. This is supported by Uboh *et al.,* (2009) who reported that kerosene contained toxic hydrocarbon that may hinder hematopoietic activity in the bone marrow leading to decreased production of Hb, RBC and platelets. MCV, MCH, MCHC, MPV, RDW-CV, RDW-SD, PDW, PCT and P-LCR showed no significant different this result is in accordance with ((Youssef *et al.,* 2023).

Kerosene contaminated diet increased Triglycerides, total cholesterol and low-density lipoprotein while increasing the high-density lipoprotein. (fig. 7) This increase may be attributed to oxidative stress due to petroleum hydrocarbon which interfered with lipid metabolism. This result was supported by the findings of Ezejiofor (*et al.,* 2014). However, administration of ethanol extract of *C.sativum* in treated groups (groups 4 and 5) reduced the triglycerides, total cholesterol and low density lipoprotein and increased high density lipoprotein this could be attributed to reduction in oxidative stress due to the presence of antioxidant constituents of *C.sativum* such as flavonoids, catechins, ribalinidines and polyphenols..

Conclusion

The results of these investigations demonstrated that ethanol extract of coriander seed possess potent bioactive and phytoconstituents that helped in ameliorating the effect of kerosene hydrocarbon on some biochemical parameters. *C.sativum* extract proved to be beneficial to health, and useful in lowering the total cholesterol and low-density lipoprotein, while improving the High-density lipoprotein, suggesting its potential effect in treatment of hyperlipidemia. *C.sativum* extract also helped to maintain the integrity of the red blood cells.

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