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Phytochemical screening and effects of aqueous extracts of *Cymbopogon citratus*(DC) Staptand *Origanum vulgare* (LINN) on the biochemical and haematological profileof Wistar strain albino rats

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Abstract

Medicinal plants have played a major role in the field of medicine as alternative therapy to orthodox drugs. This present study aimed to evaluate the acute toxicity of *Cymbopogon citratus* and *Origanum vulgare* aqueous extracts on albino rats.The qualitative phytochemical analyses of the was done using standard procedures. The LD_{50} was determined using modified Lorke's method, while the biochemical and haematological analysis were done by automated methods. Results from phytochemical analysis reveals the presence of Alkaloids, Flavanoids, Phenols and tannins, Steroids and sterols, Carbohydrates, Saponins, Protein and amino acid and Anthraquininein the two extracts. Furthermore, the electrolytes(urea and creatinine) were within the normal range in rats of the control and the orally administered aqueous extracts of *Cymbopogon citratus* and *Origanum vulgare* (100 mg/kg, 200 mg/kg and 400 mg/kg). Total protein, alkaline phosphate, total bilirubin, conjugate bilirubin, alanine aminotransferase, albumin and Aspartate aminotransferase were also within the normal range in both control and groups treated with 100mg/kg and 200mg/kg and 400mg/kg. White blood celland platelet followed same trend of falling within the normal range while Packed cell volume, Haemoglobin values were higher than the normal range across the control and test groups.

Aqueous crude extracts of*C. Citratus*and *O. vulgare*contain primary and secondary metabolites thus with potential medicinal properties as anti-inflammatory, anti- malaria, anti- viral, anti- bacteria and anti-fungal agents. Orally administered aqueous crude extracts *C. citratus and O. vulgare* (100mg/kg, 200mg/kg and 400mg/kg)have no toxicological/pathological effect on wistar strain albino rats and as such, indigenous plants safe for consumption.

Keywords: Phytochemical screening; Biochemical profile; Haematological profile; Safety; *C. citratus; O. vulgare*

1. Introduction

*C. citratus*is native is native to Sri Lanka and South India and is now widely cultivated in the tropical areas of America and Asia. The *Cymbopogon citratus*(DC.) Stapf commonly known as lemon grass is native to warm temprate and tropical part of the world, Ceylon, India, Pakistan, Srilanka, Haiti, West Indies [1]. *Cymbopogancitratus*is native to Sri Lanka and South India and is now widely cultivated in the tropical areas of America and Asia [2]. The crop grows well in both

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tropical and subtropical climates at an elevation up to 900 m. However, ideal conditions for growing lemon grass are warm and humid climate with sufficient sunshine and 250-330cm rainfall per annum, evenly distributed over most part of the year. A temperature ranging from 20-30C and good sunshine throughout the year is conducive to high crop yield. Lemon grass can also be grown in semi-arid regions receiving low to moderate rainfall. Decoction of leaf is taken orally with “mate” tea for sore throat, empacho, and as an emetic. The tea made from its leaves is popularly used as antispasmodic, analgesic, anti-inflammatory, antipyretic, diuretic and sedative. Hot water extract of dried leaves is taken orally as a hypotensive, for catarrh and rheumatism. Hot water extract of dried leaves and stem is taken orally as a renal antispasmodic and diuretic and sedative for the central nervous system

Oregano is the staple herb of Italian cuisine, most frequently used with roasted, fried, or grilled vegetables, meat, and fish. Oregano combines well with spicy foods popular in southern Italy. It is less commonly used in the north of the country, as marjoram is generally preferred. Its popularity in the U.S. began when soldiers returning from World War II brought back with them a taste for the "pizza herb", which had probably been eaten in southern Italy for centuries[3]. One of the major constituents of many different species of lemon grass (genus cymbopogoncitratus) is citral (3,7-dimethyl-2,6-octadien-al) Balbaa and Johnson,1955 [4]; [5].

Oregano is widely used in cuisines of the Mediterranean Basin and Latin America, especially in Mexican cuisine and Argentine cuisine. In Turkish cuisine, oregano is mostly used for flavouring meat, especially mutton and lamb. In barbecue and kebab restaurants, it can be usually found as a condiment, together with paprika, salt, and pepper [3]Most *Origanum* species naturally grow in Eurasia and Mediterranean zone.*Origanum vulgare*is widely distributed in the world including the Mediterranean, Irano-Turanian and Euro-Siberian regions [6].

The flowering branches are used for energy production, diarrhea, stomach booster, nervous system reliever, laxative, Reducing the general weakness of the body, anticancer, relief of migraine pain, for external use by rubbing in place of fractures and numbness of body parts and toothache, disinfection [7]. Most species of Origanum contain carvacrol as the main compound and other compounds are (thymol, gamma-terpinene, p-cymene, linalool, terpinen-4-ol, germacrene-D, beta-caryophyllene, myrcene) are found in most species [7] [8].

Hanisa*et al*., (2011) [9]determined the effects of lemon grass stem infusion (*Cymbopogon citratus*) in female *Sprague-Dawley* rats. Oregano leaves have been used as a condiment herb for flavoring fish, meat and vegetables and invivo study has been reported both the synergistic and anatagonistic effects of the substances found in oregano [10].

Oral acute toxicity testing in wistar aibino rats could be used to evaluate natural remedies for different pharmacological activities, taking into account the basic premise that pharmacology is simply toxicology at a lower dose[11]. A toxic substance might elicit interesting pharmacological effects at a lower non-toxic dose. Toxicity results from animals will be crucial in definitively judging the safety of medicinal plants if they are found to have sufficient potential for development into pharmacological products [12]. As use of medicinal plants increases, experimental screening of the toxicity of these plants is crucial to assure the safety and effectiveness of those natural sources. However, acute toxicity studies do not detect effects on vital functions like the cardiovascular, central nervous and respiratory systems which are not usually assessed during the study and these should be evaluated prior to human exposure [13]. Moreover, acute toxicity is mainly to obtain an appropriate dose for long-term toxicity tests and to find out the affected organs at the end of the treatment.This present study aimed to evaluate the acute toxicity of *Cymbopogon citratus* and *Origanum vulgare*aqueous extracts on albino rats.The qualitative phytochemical analyses of the was done using standard procedures.

2. Material and methods

2.1. ExtractionProcedures

Fresh leaves of*Cymbopogon cytratus*(AECC) and*Origanum vulgare*,were air-dried, pulverized, and extracted by cold maceration in water at room temperature (25-33 ºC) for 72 hours. The mixture was filtered and the filtrates collected were concentrated in vacuum using Rotary Evaporator to obtain the crude aqueous extracts. The percentage yield of the extracts was estimated and crude extracts were stored in the refrigerator at 4 ˚C until needed for analysis.

2.2. Phytochemical Analysis

2.2.1. Preliminary PhytochemicalScreening

Aqueous extracts of *Cymbopogon cytratus*(AECC)and*Origanum vulgare*(AEOV) were used for preliminary phytochemical analyses using standard procedures[14]. The following qualitative tests for primary and secondary metabolites including, alkaloids, flavonoids, phenols and tannins, steroids and sterols carbohydrates, saponins, glycosides, protein and amino acid and anthraquinone.

2.2.2. Quantitative phytochemicalanalysis

This analysis was done for the following primary metabolites -carbohydrates, proteins, lipids and secondary metabolites (Terpenoids, flavonoids, phenols and tannins). These were determined as follows:

Primary metabolite analysis

- Carbohydrate

Samples ofAECC and AEOV (100 mg) each was hydrolyzed in a boiling tube with 5 ml of 2.5 N HCl in a boiling water bath for a period of 3 hours. It was cooled to room temperature and solid sodium carbonate was added until effervescence ceases. The contents were centrifuged and the supernatant was made to 100 ml using distilled water. From this 0.2 ml of sample was pipetted out and made up the volume to 1 ml with distilled water. Then 1.0 ml of phenol reagent was added followed by 5.0 ml of sulphuric acid.The tubes were kept at 25-30˚C for 20 min. The absorbance was read at 490 nm[15].

- Protein

An aliquot of 1.0ml of extract was added to 5.0 ml of alkaline copper reagent was added to all the tubes and allowed it to stand for 10 min. Then 0.5 ml of Folin's Ciocalteau reagent was added and incubated in dark for 30 min. The intensity of the colour developed was read at 660nm [16].

- Total lipid content

The extracts (10 gm each) were added to 150 ml of petroleum ether for 16 hr, at a solvent condensation rate of 2–3 drops/sec according to AACC - Approved Method 30-25 with minor modifications of sample size and extraction time. The obtained extract was concentrated and evaporated at room temperature todryness.The weight of extract gives the total lipid content which was expressed as mg/g dry matter [17].

Secondary metabolite analysis

- Phenolics and Tannins

The total phenolic content was determined according to the method described by Siddhuraju and Becker, (2003) [18]. Ten microlitre aliquots each of theAECC and AEOV (2 mg/2 ml) was taken in test tubes and made up to the volume of 1 ml with distilled water. Then 0.5 ml of Folin-Ciocalteu phenol reagent (1:1 with water) and 2.5 ml of sodium carbonate solution (20%) were added sequentially in each tube. Soon after vortexing the reaction mixture, the test tubes were placed in dark for 40 min and the absorbance was recorded at 725 nm against the reagent blank. The analysis was performed in triplicate and the results were expressed as tannic acid equivalents.

Using the same extracts, tannins was estimated after treatment with polyvinyl polypyrrolidone (PVPP). One hundred milligrams of PVPP were placed in a test tube and to this 1 ml distilled water and then 1 ml of the sample extracts were added. The contents were vortexed and kept in the test tube at 4°C for 4h. Then it was centrifuged (3000 rpm for 10 min at room temperature) and the supernatant was collected. This supernatant has only simple phenolics other than tannins (the tannins would have been precipitated along with the PVPP). The phenolic content of the supernatant was measured as mentioned by Siddhuraju and Becker, (2003) [18] and expressed as the content of non-tannin phenolics (tannic acid equivalents) on a dry matter basis. From the above results, the tannin content of the sample was calculated asfollows:

$$\text{Tannin (\%)} = \text{Total phenolics (\%)} - \text{Non-tannin phenolics (\%)}$$

- Flavonoids

Total flavonoid content was determined by dispensing 0.5 ml aliquot ofAECC and AEOV appropriately (2 mg/2 ml) diluted sample solution was mixed with 2 ml of distilled water and subsequently with 0.15 ml of 5 % $NaNO_2$solution. After 6 min, 0.15 ml of 10% $AlCl_3$solution was added and allowed to stand for 6 min, and then 2 ml of 4% NaOH solution was added to the mixture. Immediately, water was added to bring the final volume to 5 ml, and then the mixture was thoroughly mixed and allowed to stand for another 15 min. Absorbance of the mixture was determined at 510 nm versus water blank. The analysis was performed in triplicate and the results were expressed as rutinequivalent as described by Zhishen*et al*. (1999) [19].

- Terpenoids

Total terpenoid content in the leaf extracts were assessed by standard method as described by Ferguson, (1956) [20]. 1 g each AECC and AEOV was taken separately and soaked in alcohol for 24 hrs. Then filtered, the filtrate was extracted with petroleum ether; the ether extract was treated as total terpenoid [19].

Animal procurement and preparation

A total of 40wistar strain albino rats (mixed male and female) which weighed between the ranged of 120 – 170 kg were obtained the animal farm of the Federal College of Animal Health and Production Technology, National Veterinary Research Institute, Vom, Nigeria. The animals were transported in suitable cages to the Biochemistry Laboratory in the same institution where they were acclimatized under temperature-controlled environment (23±2^{0}C), lighting (12hours light/12hour dark) and fed with rodent's pellets with access to clean water for a period of 14 days before commence of experiments.

Acute Toxicity Test

- Phase 1

A totalof 18healthy young adult male and female wistar albino rats, nulliparous, non-pregnant and weighing 120-150grats were randomly divided into three groups consisting of 3 animals each(n = 3/each dose) for three different concentrations of AECC. Same grouping and doses were duplicated for AEOV as follows:

- 10mg/kg per oral (*p.o*.) – AECC (3 animals) and AEOV (3 animals) respectively.
- 100mg/kg per oral (*p.o*.)- AECC (3 animals) and AEOV (3 animals) respectively.
- 1000mg/kg per oral (*p.o*.) - AECC (3 animals) and AEOV (3 animals) respectively.

The treated rats were all observed for 24 hours for possible toxicological symptom, including mortality. Prior to treatments, the animals were fasted for 12 hours with free access to water onlyusing the Lorke's model as described by Builders *et al.,* 2016 [21].

The LD_{50} was calculated using the formula:

$$LD_{50} = \sqrt{D_0 x D_{100}}$$

D_0 = Highest dose that gave no mortality
D_{100} = Lowest dose that produced mortality
No mortality case was also recorded from all groups thus, LD_{50} for AECC and AEOV $10 \geq x \leq 1000$.

2.3. Determination of AECC and AEOV effect on Biochemical and Haematological profile of rats

Thirty-two animals (male and female) which weighed between the ranged of 130 – 170 kg were randomly divided into four groups (A,B,C&D), each containing 5 animals and fasted for 24hours but allowed access to water *ad libitum*. The animals were given different treatments via the oral route as follows:Group A to C, 100mg/kg, 200mg/kg and 400mg/kg AECC respectively while Group D was administered with 2ml normal saline(control). Same was duplicated for AEOV. Feeding of the animals resumed after various treatments while the body weights were monitored every 4 days of experiment and on the 4th day14th day when blood samples were collected through retro-orbital for biochemical and haematological analysis.

Blood samples from the experimental animals were collected into plain bottles and anticoagulant bottles for biochemical and haematological analysis respectively.These were spurned at 300rpm for 5minues. Serum was separated into cryovals and analyzed by using auto- analyzer (Cobas C 111) for the biochemical examinations, while whole blood in anticoagulant bottleswereanalyzed for haematological examinations using Mindray (BG-5300).

3. Results and discussion

Table 1 Preliminary Phytochemical Screening in AECC and AEOV*C*

Plant Constituent	**Extract**		
	Aqueous Extract		**Name of the Test**
	C. citratus	***O. vulgare***	
Alkaloids	++	+	Wagner's Test
Flavonoids	+	+	Shimoda, Lead Acetate Test
Phenols and Tannins	+	+	Lead acetate Test, Ferric Chloride Test
Steroids and Sterols	++	-	Salkowski Test
Carbohydrates	-+	+	Fehlings Test, Benedicts Test
Saponin	++	+	Honey Comb Test, Foam Test
Glycosides	-	-	Glycosides Test
Protein and Amino acids	++	+	Biuret Test, Ninhydrin Test
Anthraquinone	+	-	Borntragers Test

Key: + = present, ++ = more present, - = Not present.

Table 2 Quantification of metabolites in AEOV*C and AECC*

S.NO	**Metabolites**	**Weight mg/g dw)Weight mg/g dw**	
		C. citratus	***O. vulgare***
	Secondary		
1	Flavonoid	28.80±6.24	26.26±3.20
2	Phenol	0.40±0.02	0.35±0.20
3	Tannin	0.04±0.02	0.04±0.02
4	Steroids	2.00.±0.82	1.90±0.72
	Primary		
1	Carbohydrate	140.53±24.01	135.25±14.21
2	Chlorophyll	2.00±6.01	3.01±0.02
3	Protein	101±1.27	104±2.35
4	Lipids	0.02±0.01	0.03±0.01

Key: AEOVC = aqueous extra ts *of origanum vulgare* , AECC = aqueous extract of *cymbopogon citratus* .

In this study, quantitative estimation of primary metabolites revealed various chemical constituents. Chlorophyll is the most indispensable class of primary compounds as they are the only substances that capture sunlight and make it available to plant system for its cultivation on photosynthesis. Earlier workers observed the leaves of lemon grass extract has high carbohydrate content and concluded that *Cymbopogon citrates* and *Qriganum vulgare* were very good source of energy [22];[23]. The presence of higher protein level in the plant parts towards their possible increase food value or that a protein base bioactive compound could also be isolated in future. These finding were in agreement with Akande *et al.* (2012) [24]. Lemon grass has a low level of lipid an indication that it would have little or no cholesterol.

Secondary metabolite analysis is very important for extraction, purification, separation, crystallization, identification of various phytocompounds. In table 4, Flavonoid had the highest value 28.80±6.24 26.26±3.20 followed by 2.00±0.82 and 1.90±072 aqueous crude extracts *Cymbopogon citratus*and*Qriganum vulgare.*The higher amount of flavonoid is important in regulation of plant growth, development and disease resistance these were in agreement with the work carried out by Mirghani*et al.,* 2012 [25].

Table 3a Liver function parameters profile of AECC treated rats

Liver function parameters Reference Values	**Group A 100mg/kg**	**Group B 200mg/kg**	**Group C 400mg/kg**	**Group D Control**	**F-test**	**p-value**
Total protein (g/L) 58-80	77.8±0.8^{a}	79.2±0.8^{b}	75.8±0. 8^{c}	79.0	20.857	0.001
Albumin (g/L) 35-50	50.0±1.0^{a}	40.2±0.8^{b}	50.2±0.8^{b}	50.0	24.250	0.001
Total bilirubin (µmol/L) 1.7-8.5	2.9±0.1^{a}	3.7±0.1^{b}	6.3±0.1^{c}	3.2	40.381	0.001
Conjugate bilirubin 1.7-8.5	0.9±0.1^{a}	1.4±0.1^{b}	1.9±0.1^{c}	1.0	64.667	0.001
Alkaline phosphostate (µ/L) 60-170	505.2±0.8^{a}	451.6±1.1^{b}	500.8±0.8^{c}	102.0	19.407	0.001
AST Aspostate (µ /L) Up to 22	176.2±0.8^{a}	167.2±0.8^{b}	171.2±0.6^{c}	157.0	72.805	0.001
ALT (µ/L) (up to 22)	65.2±0.8^{a}	53.3±0.1^{b}	59.2±0.1^{c}	53.0	40.078	0.001

Key: **Key**: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 3b Liver function parameters profile of AEOV treated rats

Liver function parameters Reference Values	**Group A 100mg/kg**	**Group B 200mg/kg**	**Group C 400mg/kg**	**Group D Control**	**F-test**	**p-value**
Total protein (g/L) 58-80	78.2±0.374^{a}	79.4±0.510^{ab}	75.8±0.374^{ac}	79.0	18.7	0.001
Albumin (g/L) 35-50	50.0±1.447^{a}	41.6±0.678^{b}	50.2±0.374^{ac}	50.0	90.4	0.001
Total bilirubin (µmol/L) 1.7-8.5	2.90±0.136^{a}	3.78±0.037^{b}	6.28±0.037^{c}	3.20	24.30	0.001
Conjugate bilirubin 1.7-8.5	0.92±0.037^{a}	1.48±0.037^{b}	1.88±0.037^{c}	1.0	16.6	0.001
Alkaline phosphostate (µ/L) 60-170	507±0.812^{a}	453±0.812^{b}	501±0.510^{c}	102.0	16.80	0.001
AST Aspostate (µ /L) Up to 22	176±0.374^{a}	163±2.99^{b}	171±0.270^{ab}	157.0	15.0	0.001
ALT (µ/L) (up to 22)	65.8±0.374^{a}	53.3±0.334^{b}	55.4±1.63^{c}	53.0	46.3	0.001

: **Key**: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 3a and 3b showed Liver function parameter of different plant extracts on wistar albino rats, there was no significant different between two plants. In each group there was significant different 100 mg/kg and 200 mg/kg concentrations

Table 4a Kidney function parameters profile of AECC treated rats

Kidney function parameters Reference Values	Group A 100mg/kg	Group B 200mg/kg	Group C 400mg/kg	Group D Control	F-test	p-value
Ur (mMol/L)2.5 - 6.5	8.6±0.1^{a}	8.2±0.1^{b}	8.6±0.1^{a}	5.8	38.095	0.001
Cr (mMol/L90-120	27.3±0.1^{a}	27.7±0.1^{b}	20.1±0.1^{c}	38.0	13.13	0.001
Na^{+} (mMol/L)135-150	133.2±0.8^{a}	136±0.8^{b}	136.2±0.8^{b}	144.0	26.571	0.001
K^{+} (mMol/L)3.4-5.3	5.6±0.1^{a}	4.8±0.1^{b}	5.0±0.1^{c}	5.0	33.714	0.001
Cl^{-} (mMol/L)95-110	97.8±0.8^{a}	100.2±0.8^{b}	101.2±0.8^{b}	107	21.810	0.001

Key: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 4b Kidney function parameters profile of AEOV*C* treated rats

Kidney function parameters Reference Values	Group A 100mg/kg	Group B 200mg/kg	Group C 400mg/kg	Group D Control	F-test	p-value
Ur (mMol/L)2.5 - 6.5	8.6±0.36^{a}	8.2±0.36^{b}	8.6±0.29^{a}	5.8	5.3	0.001
Cr (mMol/L} 90-120	28.3±0.58^{a}	28.1±0.27^{ab}	20.5±0.25^{c}	38.0	124	0.001
Na^{+} (mMol/L)135-150	135±0.374^{a}	138±0.316^{b}	137±0.374^{b}	144.0	21.9	0.001
K^{+} (mMol/L)3.4-5.3	5.70±0.03^{a}	4.70±0.176^{b}	5.10±0.07^{ab}	5.0	20.5	0.001
Cl^{-} (mMol/L)95-110	98.8±0.37^{a}	101±0.374^{ab}	102±0.510^{b}	107	18.7	0.001

Key: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 4a and 4b showed Kidney profile of two different plant extracts, there was no significant different between the two groups.There was significant different between 100 mg/kg and 200 mg/kg concentrations

Table 5a Haematological parameters profile of in AECC treated rats

Full blood count Reference Values	Group A 100mg/kg	Group B 200mg/kg	Group C 400mg/kg	Group D Control	F-test	p-value
Hb (g/dl) 115-161	121.20±1.30^{a}	123.00±1.00^{a}	86.40±2.51^{b}	112.00	7.400	0.001
PCV (%) 37.6-50.6	42.42±0.01^{a}	42.85±0.05^{b}	32.78±0.01^{c}	39.36	20.228	0.001
WBC (10^{12}/L) 6.6-12.6	96±0.02^{a}	8.72±0.01^{b}	6.01±0.01^{c}	8.81	58.021	0.001
RBC (10^{12}/L) 6.76-9.72	7.52±0.01^{a}	8.12±0.01^{b}	5.48±0.01^{c}	7.04	68.048	0.001
Plat (10^{9}/L) 300-500	497.00±1.22^{a}	392.60±1.14^{b}	342.20±1.30^{c}	159.00	20.200	0.001
Neut (%)	15.80±0.84^{a}	62.60±1.14^{b}	37.20±0.84^{c}	18.00	70.963	0.001
Lymp (%)	82.80±1.30^{a}	67.00±0.71^{b}	61.80±0.84^{c}	82.00	61.690	0.001

Key: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 5b Haematological parameters profile of AEOV*C* treated rats

Full blood count Reference Values	Group A 100mg/kg	Group B 200mg/kg	Group C 400mg/kg	Group D Control	F-test	p-value
Hb (g/dl) 115-161	122±0.837[a]	123.±0.40[ab]	86.4±1.12[c]	112.00	66.2	0.001
PCV (%) 37.6-50.6	42.8±0.514[a]	42.9±0.02[ab]	34.7±0.73[c]	39.36	81.2	0.001
WBC (10^{12}/L) 6.6-12.6	5.36±0.246[a]	8.72±0.01[b]	6.61±0.25[c]	8.81	70.8	0.001
RBC (10^{12}/L) 6.76-9.72	7.48±0.02[a]	8.12±0.004[ab]	5.68±0.19[c]	7.04	12.1	0.001
Plat (10^{9}/L) 300-500	343±0.678[a]	393±0.510[b]	498±0.678[c]	159.0	15.9	0.001
Neut (%)	16.4±0.510[a]	32.6±0.510[b]	37.2±0.374[c]	18.00	45.3	0.001
Lymp (%)	83.0±0.447[a]	67.0±0.316[b]	65.4±2.01[c]	82.00	65.2	0.001

Key: a-b = showed significant difference , a-c = showed significant difference,, ab = no significant difference within rows

Table 5a and 5b showed the haematological paramer of two different plant on wistar albino rats. Each of the plant boost the blood level of the animals. There was significant different between the 100 mg/kg and 200 mg/kg concentrations

In this study, the Wistar Albino rats were divided into four groups, each group contains five Wistar albino rats. Group A, B and C were treated with aqueous crude extracts from *Cymbopogon citrates*and*Qriganum vulgare* for 100 mg/kg, 200 mg/kg and 400 mg.kg respectively and group D served as control. Certain volume of extracts was administered to group A, B and C for fourteen days. During the period of acute toxicity investigation, the treated animals and control were monitor and there was no mortality. Table 6 to 8 showed kidney parameter, liver function and haematological parameter treated groups and control. The electrolyte, urea and creatinine were within the normal range for both control and groups treated with 100 mg/kg and 200 mg/kg while group treated with 400 mg was above the normal range. The total protein (PT), alkaline phosphate (ALP), total bilirubin (TB), conjugate bilirubin (CB), alanine aminotransferase (ALT), albumin (ALB) and Aspartate aminotransferase (AST) were within the normal range in both control and groups treated with 100 mg/kg and 200 mg/kg while elevated in group treated with 400 mg/kg. Packed cell volume (PCV), Haemoglobin estimation (Hb) and White blood cell (WBC) and platelet (Plat) were within the normal range for both control and test groups treated with 100 mg/kg and 200 mg/kg while group treated with 400 mg/kg were above the normal range. This study shows that at 100 mg/kg and 200 mg/kg concentration were preferable dose for the treatment. There were no significant different between the groups treated and the control. In this study, the revealed that there were no potential toxicity or damage to the cells structure of the liver, kidney and blood vessels. This was in agreement with the study carried out by Celso *et al.,* 2011 [26].

4. Conclusion

In conclusion, it was found that both *C. citratus and O. vulgare* aqueous crude extracts are source of primary and secondary metabolites, which have many medicinal properties such as anti-flammatory, anti- malaria, anti- viral, anti-bacteria and anti-fungal activities that may be used for pharmaceutical industry.The oral administration of aqueous crude extracts on wistar albino rats at different concentration show no side effects in chemistry and haematological parameter and no significant different in comparing with control Wistar albino rats. In conclusion, the indigenous plants are safe for consumption.

Compliance with ethical standards

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Disclosure of conflict of interest

All the authors declare no conflict of interest of any sort.

Statement of ethical approval

Ethical approval with reference number - AEC/02/107/21 was obtained from theAnimal Ethics Committee of the National Veterinary Research Institution, Vom, Plateau State, Nigeria.

Statement of informed consent

This is not applicable to this study; however, studies were carried out under the experimental protocol scrutiny of the Institutional Animal Ethics Committee of the Federal College of Animal Health and Production Technology, NVRI, Vom, Plateau State, Nigeria.

References

[1] Ojo OO,Kabutu M, Bello U,Babayo U. Inhibition of paracetamol induced oxidative stress in rats by extracts of lemon grass (*Cymbopogon citratus*) and green tea (Camellia sinensis) in rats. Afr J Biotechnol. 2006;(5):1227-1236

[2] Tangpu V. Yadav AK. Pharmacology online.2006(2): 290-298.

[3] Balbaa ST Johnson CH. The microscopic structure of lemon grass leaves. J AM Pharm Assoc Am pharm Assoc (Baltim) 1955; 44(2):89-98

[4] Banthorpe DV, Duprey RJ, Hassan M, Janes JF, Modawi. BM.Chemistry of yhe Sudanese flora. I. Essentail oils of some cymbopogon species. Planta Med. 1976:29(1):10 -25

[5] MartyrisN. "GIs Helped Bring Freedom to Europe, And A Taste for Oregano to America". NPR. 2015: Retrieved 28 May 2018.

[6] Ietswaart JH. A taxonomic revision of the genus Origanum (Labiatae): (Labiatae). Springer, Netherlands.1980

[7] Nabavi SM, Marchese A, Izadi M, Curti V, Daglia M, Nabavi SF. Plants belonging to the genus thymus as antibacterial agents: From farm to pharmacy food Chem. 2015 (173): 339-347

[8] Jshi PK, Joshi N Tewari G, Tandon S. Chemical, biocidal and pharmacological aspects of origanum species. A brief a review.Journal of Indian Chem. Soc. 2015: (92): 1603- 1615/

[9] Zolfeghari E,Adeli I,Mozafarian V,Babaiy S,Bibalan GHH. (2012).Identification of Arasbaran medicinal plants and ethnobotanical study of rural people knowledge (Case Study: Arasbaran forest, Mardanaghom watershed).Iran J Med Aroma Plants. 2012:28(3):534-50.

[10] Hanisa H,Hadijah H,Rasedee A,Tarmizi AS. Sub-acute oral administration of *Cymbopogon citratus* stem infusion and its effects on blood biochemical parameters, body and organ weights in rats. J. Trop. Agric. and Fd. Sc.2011: 39(1)2- 31.

[11] Sasidharan S Darah I Jain K.In vivo and in vitro toxicity study of Gracilariachangii. Pharm. Biol. 2008: (46): 413-417.

[12] Moshi MJ.Brine shrimp toxicity evaluation of some Tanzanian plants used traditionally for the treatment of fungal infections. Afr. J. Tradit. Complement. Altern. Med.2011: 4: 219-225.

[13] Syahmi ARM,Vijayarathna SSasidharan S, Yoga LL, Kwan YP, Lau YL, Shin LN, Chen Y. Acute oral toxicity and brine shrimp lethality of Elaeisguineensis Jacq., (Oil Palm leaf) methanol extract. Molecules.2010; 15: 8111-8121.

[14] Geetha TS, Geetha N.Phytochemical screening, quantitative analysis of primary and secondary metabolites of Cymbopogancitratus (DC) stapf. leaves from Kodaikanal hills, Tamilnadu. Int J PharmTech Res. 2014; 6:521-9.

[15] Krishnaveni S, Balasubramanian T,Sadasivam S. Phenol sulphuric acid method. Food Chemistry. 1984; 15: 229.

[16] LowryOHRoseobrough NJ, Farr, AL Randall RJ. Protein measurement with folin phenols reagent. Journal of Biological Chemistry. 1957: 93: 265-275.

[17] Cheung PCK, Leung AYH, Ang PO. Comparison of supercritical carbon dioxide and Soxhlet extraction of lipids from a brown seaweed, Sargassum hemiphyllum (Turn.) C. Ag. J. Agric. Food Chem. 1998: 46: 4228-4232.

[18] Siddhuraju P, Becker K.Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of Drumstick tree (Moringa oleifera Lam.) leaves. J Agric Food Chem.2003: 51: 2144 –2155.

[19] Zhishen J.MengechengT .Jianming W. The determination of flavonoid content on mulberry and their scavenging effects on superoxide radical. Food Chem.1999: 64: 555-559.

[20] FergusonN.A textbook of pharmacognosy, Max Millam Company, 1956:191.

[21] Builders MI, Builders PF, OgundekoTG. Anti-ulcer activity of the stem bark of Africanlocust bean tree in rats. Int. J. Phytotherapy Research. 2016; 6(4): 133-145.

[22] Murray AP, Gibbs CF, Longmore AR. Determination of chlorophyll in marine waters: Inter comparison of a Rapid HPLC method with full HPLC, Spectrophotometric and Fluorometric methods. Marine chemistry.1986: 19: 211-227.

[23] Ozcan MM,OzcanE,Herkan E. Antioxidant activity, Phenolic content and Peroxide value of essential oil and extracts of some medical and aromatic plants used as condiments and herbal teas in Turkey. J. Med. Fd 2009; 12(1):198- 202.

[24] Akande IS. Samuel TA.Agbazue U.Olowolagba BL.Comparative proximate analysis of ethanolic and water extracts of *Cymbopogon citratus* (lemon grass) and four tea brands. Journal of Pharmaceutical and Biomedical Sciences. 2012:22 (03).

[25] Mirghani MES,Liyana Y, ParveenJ. Bioactivity analysis of lemon grass (Cymbopogancitratus) essential oil. International food research journal.2012: 19(2): 569-575.

[26] Celso ARA, Costa A, Lucas T,BidinottoBC,ReginaK,TakahiraD, DaisyMF,SalvadorC, Luis F,Barbisan B,Mirtes Costa A. Cholesterol reduction and lack of genotoxic or toxic effects in mice after repeated 21-day oral intake of lemongrass (*Cymbopogon citratus*) essential oil. Food and Chemical Toxicology. 2011; 49: 2268–2272.