RESEARCH PAPER

An in-depth laboratory analysis of the Phytochemical and Pharmacological characteristics of water-based and ethanol-based extract of Maerua oblongifolia

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ABSTRACT
Maerua oblongifolia A. Rich finds extensive use in a diverse array of traditional applications related to plants. The findings of the present study indicate that the initial investigation of the chemical properties of both the ethanol and water-based extracts of *Maerua oblongifolia* showed the existence of alkaloids, steroids, proteins, flavonoids, phenolic compounds, tannins, and carbohydrates. The measurement of total flavonoids and phenol indicates that MRO's ethanol and water-based extracts contain the greatest amounts of flavonoids and phenol, which emphasizes its noteworthy antioxidant potential. The MRO ET and MROA extracts demonstrated considerable antioxidant effects in the DPPH testing method, attaining a rate of suppression of 85% and 84% at a concentration of 50 mg/ml, with an IC_{50} measurement of 149.83 mg/ml and 19.58 respectively, in comparison to ascorbic acid, which was the standard. In the FRAP test, both extracts at concentrations of 150 and 200 mg/ml (MRO ET-1.73 OD and MROA -1.31 OD) showed considerable activity compared with the standard Vitamin C. Further studies into the anti-inflammatory effects of MRO ET and MROA were conducted using a protein denaturation assay. The findings revealed that at concentrations between 50 and 100 mg/ml, MRO ET and MROA produced an inhibition rate of 33% and 40%, with an IC_{50} value of 44.1307 mg/ml and 101.6209 mg/ml, whereas diclofenac sodium was the standard. Overall, the investigation revealed that both extracts possess significant antioxidant activity and moderate anti-inflammatory activity

Keywords: *Maerua oblongifolia,* antioxidant DPPH and FRAP assays, Phytochemical, Total Flavonoids, Total Phenol and anti-inflammatory

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INTRODUCTION

In today's world, the use of herbal remedies is becoming increasingly popular as people's trust in natural healing methods continues to grow[1]. *Maerua oblongifolia* is one of the most frequently utilized botanical species for the treatment of a variety of ailments, including gastrointestinal discomfort, nephrolithiasis, hyperglycemia, pyrexia, dermal infections, seizures, pruritus, cough, and abdominal colic. Therefore, it is imperative to conduct a comprehensive scientific assessment of *Maerua oblongifolia* to elucidate its pharmacological properties.

Taxonomical Classification

Kingdom: Plantae
Division: Tracheophyta
Class: Magnoliopsida
Order: Brassicales
Family: Capparaceae
Genus: Maerua
Species: *Maerua oblongifolia*
Common Name : Necklace-berried Caper
Vernacular Names : Nelasakaregedde (Kannada), Bhumichakkarai, Mochukkodi (Tamil), Peeluparni (Sanskrit)
Synonyms : Maerua arenaria, Capparis oblongifolia, Maerua scabra

Traditionally and in contemporary practices, Murva is employed in the formulation of numerous herbal remedies; however, further research is necessary to provide the scientific validation required to substantiate its extensive therapeutic capabilities[2]. The foliage and

root structures of *Maerua oblongifolia* A. Rich have been utilized for numerous generations. This shrub holds significant mythological value within Indian cultural paradigms. *Maerua oblongifolia* A. Rich is associated with a multitude of ethnobotanical applications[3]. Biologically synthesize ZnO NPs utilizing the leaves of Ochradenus arabicus and to investigate their influence on the morphological and physiological properties of *Maerua oblongifolia* cultured in vitro. The results indicate that bioengineered ZnO NPs significantly contribute to biomass accumulation and enhance the activities of antioxidant enzymes within plant tissues[4]. Biosynthesized silver nanoparticles (AgNPs), characterized by a spherical morphology (size range between 9 and 30 nm), were assessed for their impacts on the morphophysiological attributes and the antioxidant defense mechanisms of in vitro cultivated *Maerua oblongifolia* under varying levels of salt stress (0, 50, 100, and 200 mM NaCl). Our results demonstrate that the application of AgNPs (0, 10, 20, and 30 mg/L) to *M. oblongifolia* shoots significantly mitigates the detrimental effects of salt stress while enhancing parameters related to plant development and defense systems[5]. Physicochemical characterization methods, including ultraviolet-visible spectroscopy, Fourier transform infrared spectroscopy, and transmission electron microscopy, were employed to characterize and obtain microphotographs of the AgNPs. Shoots of *M. oblongifolia* (2-3 cm) cultured in Murashige and Skoog medium supplemented with various concentrations of AgNPs (0, 10, 20, 30, 40, or 50 mg L-1) were utilized for experimentation. Our findings suggest that green-synthesized AgNPs may hold significant agricultural and medicinal relevance due to their effects on plant systems in vitro [6]. The root bark extract of the *Maerua oblongifolia* plant was utilized in the green synthesis of titanium dioxide nanoparticles (TiO2 NPs) for photocatalytic degradation of hazardous pollutants and antibacterial activities in the present study. The root bark extract functioned as a novel capping and reducing agent for the first time in this context[7]. To explore diverse types of secondary metabolites, phytochemical screening evaluations were executed utilizing established protocols. To obtain unrefined extracts, roots, root bark, stem bark, and leaves underwent maceration using water and ethanol. According to the phytochemical investigation, the examined plant components contained alkaloids, saponins, tannins, phenols, carbohydrates, and proteins[8]. The ethanol extract was found to contain alkaloids, phytosterols, and saponins, while the aqueous extract contained alkaloids, carbohydrates and glycosides, saponins, proteins, and amino acids, according to initial phytochemical research[9]. The total phenolics, flavonoids, and tannins present in *Maerua oblongifolia* root bark extracts were revealed using different solvent extracts, along with their phytochemical components, antioxidant capabilities, and antibacterial capabilities. Phenol, DPPH, and FRAP had a substantial positive link with PC1, while flavonoid and tennis were represented by PC2[10]. This established procedure for generating numerous copies of *M. oblongifolia* removes the need to depend on naturally growing populations for the production of seeds and will similarly assist in the preservation of this plant species that is in danger [11]. Phytochemical analysis of *M. oblongifolia* leaves was conducted using gas chromatography-mass spectrometry (GC–MS) to identify various compounds. The GC–MS investigation identified 21 different phytochemicals, encompassing both high and low molecular weight substances[12]. The methanolic extract displayed greater antimicrobial efficacy when compared to petroleum ether, chloroform, ethyl acetate, and acetone extracts. The current research indicates that the leaf extracts possess bioactive molecules exhibiting antimicrobial properties against the tested bacterial and fungal strains, presenting substantial promise for creating an innovative, broad-spectrum antimicrobial drug formulation derived from *M. oblongifolia* leaves [13]. Floating microballoons loaded with *Maerua oblongifolia* (Forsk) A. Rich root aqueous extract (FMMO) were created to assess their anti-ulcer properties in Wistar Albino rats. The in vivo anti-ulcer effectiveness was assessed using ulcer models induced by indomethacin, pylorus ligation, and cysteamine. The solvent extraction of *M. oblongifolia* root resulted in a 20% w/w yield, with carbohydrates, proteins, amino acids, and glycosides being the primary bioactive components[14]. The extraction process of *Maerua oblongifolia* yielded, alongside previously identified compounds, three lupane triterpenoids; one of these compounds is a novel natural product, which was characterized utilizing one-dimensional and two-dimensional NMR, mass spectrometry, and infrared spectroscopy, specifically identified as lup-20(29)-en-3β, 30-diol[15]. The plasma generated by laser interaction was produced on pelletized samples derived from the roots, stem, leaves, and fruits, allowing for the recording and analysis of the corresponding emission spectra[16]. The leaf exhibits amphistomatic characteristics, predominantly featuring anamocytic stomata, with a limited presence of tetracytic stomata. A transverse section of the leaf reveals a ribbed structure on both sides adjacent to the midvein, with an epidermis consisting of a single layer. The mesophyll is distinctly categorized into palisade and spongy tissues. The ground tissue within the midvein displays differentiation into palisade, collenchyma, and parenchyma tissues[17]. This is attributed to the presence of bioactive substances like alkaloids, flavonoids, steroids, saponins, and quinones. Such studies would aid in uncovering the medicinal significance of M. oblongifolia and its potential in creating new pharmacological agents for addressing important health challenges[18]. The effect of Maerua oblongifolia on wound healing was evaluated in albino rats. Complete healing of wounds was noted in the rats treated with Maerua oblongifolia after 15 days, comparable to those treated with Soframycin ointment. The results from this study suggest that the ethanol extract of Maerua

oblongifolia is effective in preventing the proliferation of pathogens associated with wounds and accelerates the healing process[19]. The water-based extract of Murva roots demonstrated safety at a dosage of 2000 mg/kg; therefore, a dosage of 800 mg/kg was chosen for the anti-diabetic research. The test exhibited notable anti-diabetic effects when assessed against both positive and negative controls. Thus, the root extract of Murva may offer benefits for individuals with diabetes mellitus[20]. Its seed germination rates are low, and it is utilized in numerous traditional and medicinal practices. Due to its limited seed viability and other factors, this plant has become rare, highlighting the urgent requirement for the use of this significant medicinal species[21]. The natural regeneration of this species is minimal and takes place via seed and tuber. Consequently, a micropropagation method in vitro has been established for M. oblongifolia. This propagation technique will aid in the conservation of the species and provide an alternative route for the production of secondary metabolites[22]. This study is centered on the evaluation of in vitro antioxidant properties via the DPPH and FRAPS method and the assessment of anti-inflammatory effects through the protein denaturation technique on ethanolic and aqueous extract of *Maerua oblongifolia* (MRO ET and MROA), to analyze its phytochemical and pharmacological characteristics.

MATERIAL AND METHODS

Collection of samples:

Maerua oblongifolia acquired from the Aravind herbal lab located in Rajapalayam, Tamilnadu for this study.

Method of preparation of samples:

Ten grams of the *Maerua oblongifolia* is subjected to heating with 100 ml of ethanol and aqueous independently for duration of five hours using a reflux condenser in a water bath, then allowed to cool and filtered. The resulting filtrate is then concentrated under vacuum to obtain the ethanolic and aqueous extract. These extract is used for pharmacological and phytochemical activity.

METHODOLOGY

PHYTOCHEMICAL ANALYSIS TEST

Phytochemical analysis is the technique employed to detect different substances present in plant extracts. Plants consist of a wide range of chemical components that can trigger various physiological effects and provide health benefits. As a result, it is common to investigate plants for the presence of biologically active and therapeutically important phytochemicals. These compounds contribute to specific biological activities. Examples of phytoconstituents include alkaloids, steroids, carbohydrates, saponins, tannins, and flavonoids among others[23, 24].

ESTIMATION OF TOTAL FLAVONOIDS:

The amount of flavonoids in the plant extract was measured using the Aluminium chloride method. 1 ml of *Maerua oblongifolia* ethanolic and aqueous extract after hexane (1mg/ml) in methanol and 1ml of the standard quercetin (200,400,600,800, and 1000µg/ml) in methanol are kept in ten millilitre of the standard measuring flask, & then 4ml of distilled water was added and then 0.3 ml of 5% sodium nitrite was added and after 5minutes 0.3ml of 10% Aluminium chloride was added. Two ml of 1Molar NaOH was added after five minutes and made up to 10 ml with distilled water. Using a UV-VIS spectrophotometer. The absorbance of both the crude extract and standard quercetin was checked at 510 nm against the reagent blank. The flavonoid content in each gram of dried crude extracts was expressed as milligrams of quercetin equivalents. The test sample's absorbance was measured three times[25, 26].

ESTIMATION OF TOTAL PHENOL:

The overall amount of polyphenols in the crude extract was measured using the Folin-Ciocalteu method and a UV-VIS spectrophotometer. 1ml of the ethanolic and aqueous extract of *Maerua oblongifolia* (1mg/ml) in methanol and l inl of the standard Galhe acid (200, 400, 600. 800, 1000µg/ml) in methanol were taken in a different 25 al volumetric flask. 9ml of the distilled water was added to each volumetric flask and mixed well. The mixture was combined with: one millilitre of the folinCiocalteu reagent and forcefully shaken. 10ml 7percentage NaCO3 solution was added to the mixt are after 5 minutes. Using distilled water, the volume was adjusted to 25ml after a ninety-minute incubation at room temperature. The absorbance of both the test and standard was measured at 550nm with a reagent blank using a UV-VIS spectrophotometer. The absorbance of the test sample was taken three times. There was a linearity curve for the Gallic acid[27, 28].

PHARMACOLOGICAL EVALUATION

In vitro Antioxidant activity

Maerua oblongifolia ethanolic and aqueous extract investigated for in vitro antioxidant activity by DPPH and FRAP for the estimation of anti-oxidant potential of *Maerua oblongifolia* ethanolic and aqueous extract. *Maerua oblongifolia* also tested by DPPH and FRAP.

Antioxidant Activity by DPPH Assay

DPPH (2,2-Diphenyl-1-Picryl-Hydrazyl- Hydrate) Assay

Procedure:

A arrangement of DPPH at a concentration of 6×10-5M in methanol was made by dissolving 7.89mg in 100ml, which implies for 250ml, you'd utilize (7.89/100) ×250. At that point, 500µl from each test arrangement was set into an Eppendorf tube. Each concentration was tried three times. Following, 500µl of the DPPH solution was included to the test arrangement and blended well. This blend was shaken and cleared out at room temperature

for half an hour. The absorbance was at that point measured at 520nm. Ascorbic corrosive served as the positive control, whereas refined water acted as the negative control. The rate restraint compared to the standard was calculated utilizing the condition underneath, and the IC50 values were too decided. Graph Pad Prism 9 software[29, 30, 31, 32, and 33].
Calculate the percentage inhibition values using the following equation:
% Inhibition = (Blank DPPH solution absorbance – Actual absorbance) x 100% / Blank DPPH solution absorbance.

FRAP (Ferric Reducing Antioxidant Power) Assay Procedure:
For ideal and steady comes about, as it were crisply gathered tests ought to be utilized. The extraction from plant materials can be performed with a assortment of solvents such as water, methanol, ethanol, or acetone. The fitting extraction procedure is decided by the nature of the particular test being prepared. A weakening arrangement was made with the plant substances. To each of the tubes, 2.5 ml of phosphate buffer (0.2 M, pH 6.6) was presented. Each tube's substance was blended altogether. In this way, 2.5 ml of a 1% potassium ferricyanide K3F (CN) 6 arrangement was included to each test. Taking after this, each response blend was unsettled energetically employing a vortex shaker. The tests were set to hatch at a temperature of 50°C for roughly 20 minutes. Once the hatching was completed, 2.5 ml of 10% trichloroacetic corrosive (TCA) was presented to each test. The test tubes experienced centrifugation at 3,000 rpm for a term of 10 minutes. From the coming about centrifuged tests, 2.5 ml of supernatant was gotten in unmistakable test tubes. In those recently procured isolated test tubes, 0.5 ml of ferric chloride (FeCl3) was joined. This brought about within the arrangement of a somewhat blue tint. Hence, absorbance was evaluated at a wavelength of 700 nm. A test with the next concentration displayed more prominent absorbance, while the speak connected to tests with lower concentrations. Ascorbic corrosive served as the positive control, whereas refined water acted as the negative control. The test was rehashed three times. At long last, the rate of antioxidant action and IC50 values were computed utilizing Graph Pad Crystal 9 computer program[34, 35, and 36].

***In-vitro* Anti-Inflammatory Activity**
In vitro Egg Albumin Denaturation Method
Inhibition of Albumin Denaturation:
The response blend was made by combining 0.5 ml of Boswellic acid corrosive and a 0.45 ml fluid arrangement of 5% bovine egg whites. The pH of the blend, which was 6.3, was balanced with a bit of 0.1N HCl whereas keeping it at 37 ˚C for 20 minutes. After that, it was warmed to 57 ˚C for 30 minutes. Once cooled, the arrangement was exchanged to 96-well plates, and the absorbance was measured at 660 nm. Standard was utilized as Diclofenac sodium (1000µg/ml) and the control contain 0.05ml refined water[37]. The rate of restraint of egg whites denaturation was calculated by the taking after equation,

$$Percentage\ of\ Inhibition\ (\%) = \frac{Absorbance\ of\ Control - Absorbacne\ of\ Test\ Sample}{Absorbance\ of\ Control}\ x\ 100$$

Where, Control – Reaction mixture except drug, Test Sample – Reaction mixture containing the sample

RESULT
Phytochemical studies:
Primary phytochemical studies of the ethanolic extract of *Maerua oblongifolia* detected the existence of alkaloids, flavonoids, phenol, tannins, steroid, protein and carbohydrates. The results of the current study indicates that the ethanolic extract of MRO ET, at a level of 300, features a total flavonoid composition of 33 mg, demonstrating a positive comparison to other levels, and the ethanolic extract of *Maerua oblongifolia* (MRO ET), at a level of 1000, features a total phenol composition of 82 mg, indicating a favorable comparison to other levels. The determination of total flavonoids indicates that the ethanolic extract of MRO ET features the highest levels of flavonoids implying that MRO ET possesses potent antioxidant activity.
Primary phytochemical studies of the aqueous extract of *Maerua oblongifolia* detected the existence of alkaloids, flavonoids, phenol, tannins, steroid, protein and carbohydrates. The results of the current study shows that the aqueous extract of MROA, at a level of 100, features a total flavonoid composition of 57 mg, demonstrating a positive comparison to other levels, and the aqueous extract of Maerua oblongifolia (MROA), at a level of 1000, features a total phenol composition of 45 mg, indicating a favorable comparison to other levels. The determination of total flavonoids and phenol indicates that the aqueous extract of MROA features the highest levels of flavonoids and phenol implying that MROA possesses potent antioxidant activity.

Antioxidant activity
Maerua oblongifolia ethanolic extract (MRO ET) has been shown to possess qualities that combat inflammation and oxidation. The DPPH assay was used in this study to demonstrate the in vitro antioxidant capabilities of MRO ET. The DPPH assay revealed an inhibition rate of 85% at a concentration of 50 mg/ml, with an IC_{50} value of 149.83 mg/ml, compared to the standard ascorbic acid, which had an IC_{50} value of 33.7334 mg/ml. This demonstrates that, in comparison to Vitamin C, MRO ET exhibits considerable antioxidant action, as determined by the DPPH test. According to the FRAP assay, Ethanolic Extract of *Maerua oblongifolia* (MRO ET) had components with dose-dependent in vitro antioxidant properties. When compared to conventional ascorbic acid under identical circumstances. The extract's 150 and 200 mg/ml (MRO

ET-1.73 OD) concentration had considerably higher activity than conventional Vitamin C.

Maerua oblongifolia aqueous extract (MROA) has been reported to produce effects that are both anti-inflammatory and antioxidant. In the course of the current research, MROA displayed antioxidant action in vitro, as determined by the DPPH assay. The DPPH assay revealed an inhibition rate of 84% at a concentration of 50 mg/ml, with an IC_{50} value of 19.58 mg/ml, compared to the standard ascorbic acid, which had an IC_{50} value of 33.7334 mg/ml. This demonstrates that, in comparison to Vitamin C, MROA's antioxidant activity as measured by the DPPH assay is favorable. According to the FRAP assay, Aqueous Extract of *Maerua oblongifolia* (MROA) had components that were dose-dependent antioxidants in vitro. When compared to regular ascorbic acid while being subjected to comparable conditions. The extract's concentration of 150 mg/ml (MROA-1.31 OD) had a higher activity than conventional Vitamin C.

Anti-inflammatory:

The albumin denaturation technique was used to evaluate anti-inflammatory action in vitro. Ethanolic extract of *Maerua oblongifolia* (MRO ET) demonstrated a 33% inhibition at 100 mg/ml and an IC_{50} value of 44.1307 mg/ml, compared to the standard diclofenac sodium, which had an IC_{50} value of 121.29 mg/ml. During our dose-dependent research of various concentrations, we discovered that numerous concentrations of *Maerua oblongifolia* (MRO ET) had antioxidant and anti-inflammatory qualities. *Maerua oblongifolia* (MRO ET) demonstrated moderate anti-inflammatory benefits when compared to diclofenac sodium, suggesting that it is important for antioxidant activity.

The albumin denaturation method was used to measure anti-inflammatory action in vitro. At 50 mg/ml, aqueous extract of *Maerua oblongifolia* (MROA) showed a 40% inhibition and an IC_{50} value of 101.6209 mg/ml, compared to the standard diclofenac sodium, which had an IC_{50} value of 121.29 mg/ml. During our dose-dependent research of various concentrations, we discovered that numerous concentrations of *Maerua oblongifolia* (MROA) had antioxidant and anti-inflammatory qualities. When compared to diclofenac sodium, *Maerua oblongifolia* (MROA) exhibited moderate anti-inflammatory effects, suggesting that it is beneficial for antioxidant activity.

TABLES

Table 1. Phytochemical Studies - *Maerua oblongifolia* [- absence; + presence]

S.No	Phytochemical Test	Ethanol extract	Aqueous extract
1.	Alkaloids	+	+
2.	Flavonoids	+	+
3.	Tannins	+	+
4.	Phenols	+	+
5.	Proteins	+	+
6.	Saponin	_	_
7.	Carbohydrates	+	+
8.	Steroids	+	+
9.	Terpenoid	_	_

Table 2. Total Flavonoids - *Maerua oblongifolia* (MRO ET)

S.NO	Concentration	OD	Average	Total flavonoids
1	100	0.03	**0.02**	**28 mg**
2		0.02		
3		0.02		
1	200	0.03	**0.03**	**27 mg**
2		0.03		
3		0.04		
1	300	0.04	**0.04**	**33 mg**
2		0.04		
3		0.05		
1	STANDARD (Quercetin)	0.07	-	
2		0.11		
3		0.12		

Table 3. Total Flavonoids - *Maerua oblongifolia* Aqueous (MROA)

S.NO	Concentration	OD	Average	Total flavonoids
1	100	0.04	**0.04**	**57 mg**
2		0.04		
3		0.05		
1	200	0.06	**0.05**	**45 mg**
2		0.05		
3		0.04		
1	300	0.07	**0.05**	**41 mg**
2		0.06		
3		0.05		
1	STANDARD (Quercetin)	0.07	-	
2		0.11		
3		0.12		

Table 4. Total Phenol - *Maerua oblongifolia* (MRO ET)

S. NO	CONCENTRATION	SAMPLE OD	SANDARD OD	TOTAL PHENOL
1	**200**	0.03	0.10	30 mg
2	**400**	0.05	0.13	38 mg
3	**600**	0.08	0.10	80 mg
4	**800**	0.08	0.10	80 mg
5	**1000**	0.09	0.11	82 mg

Table 5. Total Phenol - *Maerua oblongifolia* Aqueous (MROA)

S. NO	CONCENTRATION	SAMPLE OD	SANDARD OD	TOTAL PHENOL
1	**200**	0.02	0.10	20 mg
2	**400**	0.03	0.13	23 mg
3	**600**	0.04	0.10	40 mg
4	**800**	0.03	0.10	30 mg
5	**1000**	0.05	0.11	45 mg

Table 6. *Maerua oblongifolia* (MRO ET) *In vitro* antioxidants activity by DPPH assay

S.NO	Concentration(mg)	COD	SOD	%inhibition	Average (%)	IC_{50} value
1	50 mg	0.28	0.05	82%	**85 ± 3.14**	149.83mg/ml
2		0.28	0.04	85%		
3		0.28	0.03	89%		
4		0.28	0.04	85%		
5		0.28	0.03	89%		
6		0.28	0.05	82%		
1	100 mg	0.28	0.04	85%	**84 ± 4.22**	
2		0.28	0.03	89%		
3		0.28	0.06	78%		
4		0.28	0.05	82%		
5		0.28	0.04	85%		
6		0.28	0.03	89%		
1	150 mg	0.28	0.05	82%	**81±4.95**	
2		0.28	0.04	85%		
3		0.28	0.05	82%		
4		0.28	0.03	89%		
5		0.28	0.06	78%		
6		0.28	0.07	75%		

1	Vitamin C	0.28	0.03	89%	**90 ± 1.73**
2		0.28	0.03	89%	
3		0.28	0.02	92%	

Table 7. *Maerua oblongifolia* (MRO ET) Antioxidant activity IC_{50} value (mg/ml) compared to standard Vit C IC_{50} value (mg/ml)

S.NO	Concentration (mg)	Average (%)	IC_{50} (mg/ml)
1	50 mg	85%	149.83 mg/ml
2	100 mg	84%	
3	150 mg	81%	
Standard Ascorbic acid vitamin C			
1	50 mg	91%	**33.7334 mg/ml**
2	100 mg	87%	
3	150 mg	86%	
4	200 mg	92%	
5	250 mg	84%	

Table 8. *Maerua oblongifolia* Aqueous (MROA) *In vitro* antioxidants activity by DPPH assay

S.NO	**Concentration(mg)**	**COD**	**SOD**	**%inhibition**	**Average (%)**	**IC_{50} value**
1	50 mg	0.28	0.04	85%	**84 ± 4.35**	19.58 mg/ml
2		0.28	0.03	89%		
3		0.28	0.03	89%		
4		0.28	0.05	82%		
5		0.28	0.06	78%		
6		0.28	0.05	82%		
1	100 mg	0.28	0.03	89%	**79 ± 5.31**	
2		0.28	0.07	75%		
3		0.28	0.07	75%		
4		0.28	0.05	82%		
5		0.28	0.06	78%		
6		0.28	0.06	78%		
1	150 mg	0.28	0.05	82%	**83±3.72**	
2		0.28	0.04	85%		
3		0.28	0.04	85%		
4		0.28	0.03	89%		
5		0.28	0.05	82%		
6		0.28	0.06	78%		
1	Vitamin C	0.28	0.03	89%	**90 ± 1.73**	
2		0.28	0.03	89%		
3		0.28	0.02	92%		

Table 9. *Maerua oblongifolia* Aqueous (MROA) Antioxidant activity IC_{50} value (mg/ml) compared to standard Vit C IC_{50} value (mg/ml)

S.NO	Concentration (mg)	Average (%)	IC_{50} (mg/ml)
1	50 mg	84%	19.58 mg/ml
2	100 mg	79%	
3	150 mg	83%	
Standard Ascorbic acid vitamin C			
1	50 mg	91%	**33.7334 mg/ml**
2	100 mg	87%	
3	150 mg	86%	
4	200 mg	92%	
5	250 mg	84%	

Table10. *Maerua oblongifolia* (MRO ET) In vitro antioxidants activity by FRAP assay

S.NO	Concentration(mg)	OD	Average
1	50 mg	1.63	1.65
2		1.67	
3		1.64	
1	100 mg	1.69	1.68
2		1.72	
3		1.63	
1	150 mg	1.71	1.73
2		1.73	
3		1.76	
1	200 mg	1.72	1.73
2		1.77	
3		1.70	
Standard			
S.NO	**Concentration(mg)**	**OD**	**Average**
1	50 mg	0.31	0.31
2		0.26	
3		0.36	
1	100 mg	1.75	1.73
2		1.69	
3		1.74	
1	150 mg	1.72	1.74
2		1.78	
3		1.73	
1	200 mg	1.77	1.76
2		1.73	
3		1.79	

Table 11. *Maerua oblongifolia* Aqueous (MROA) In vitro antioxidants activity by FRAP assay

S.NO	Concentration(mg)	OD	Average
1	50 mg	0.86	0.86
2		0.84	
3		0.89	
1	100 mg	1.05	1.05
2		1.02	
3		1.08	
1	150 mg	1.33	1.31
2		1.29	
3		1.31	
Standard			
S.NO	**Concentration(mg)**	**OD**	**Average**
1	50 mg	0.38	0.42
2		0.43	
3		0.46	
1	100 mg	1.73	1.75
2		1.76	
3		1.78	
1	150 mg	1.81	1.85
2		1.85	

3		1.89	

Table 12. *Maerua oblongifolia* (MRO ET) *In vitro* anti-inflammatory activity

S.NO	Concentration(mg)	COD	SOD	%inhibition	Average	$IC_{50\ (mg/ml)}$
1	50 mg	0.29	0.20	31%	23.66±6.350	44.1307 mg/ml
2		0.29	0.23	20%		
3		0.29	0.23	20%		
1	100 mg	0.29	0.20	31%	33±1.732	
2		0.29	0.19	34%		
3		0.29	0.19	34%		
1	150 mg	0.29	0.18	37%	29.3±6.806	
2		0.29	0.21	27%		
3		0.29	0.22	24%		
1	200 mg	0.29	0.21	27%	25±1.732	
2		0.29	0.22	24%		
3		0.29	0.22	24%		
In vitro Standard Diclofenac sodium						
1	100 mg	0.29	0.08	72%	74±1.732	
2		0.29	0.07	75%		
3		0.29	0.07	75%		

Table 13. *Maerua oblongifolia* (MRO ET) Anti-Inflammatory Activity IC_{50} Value (mg/ml) Compared to Standard Diclofenac Sodium IC_{50} Value (mg/ml)

S.NO	Concentration (mg)	Average (%)	$IC_{50\ (mg/ml)}$
1	50 mg	24%	44.1307 mg/ml
2	100 mg	33%	
3	150 mg	29%	
4	200 mg	25%	
Standard Diclofenac sodium			
1	50 mg	91%	**121.29 mg/ml**
2	100 mg	93%	
3	150 mg	85%	
4	200 mg	89%	
5	250 mg	88%	

Table 14. *Maerua oblongifolia* Aqueous (MROA) *In vitro* anti-inflammatory activity

S.NO	Concentration(mg)	COD	SOD	%inhibition	Average	$IC_{50\ (mg/ml)}$
1	50 mg	0.30	0.19	36%	39.66±3.511	101.6209 mg/ml
2		0.30	0.17	43%		
3		0.30	0.18	40%		
1	100 mg	0.30	0.20	33%	34.33±5.131	
2		0.30	0.18	40%		
3		0.30	0.21	30%		
1	150 mg	0.30	0.22	26%	27.33±5.131	
2		0.30	0.23	23%		
3		0.30	0.20	33%		
In vitro Standard Diclofenac sodium						
1	100 mg	0.30	0.06	80%	77.33±2.309	
2		0.30	0.07	76%		
3		0.30	0.07	76%		

Table 15. *Maerua oblongifolia* Aqueous (MROA) Anti-Inflammatory Activity IC_{50} Value (mg/ml) Compared to Standard Diclofenac Sodium IC_{50} Value (mg/ml)

S.NO	Concentration (mg)	Average (%)	$IC_{50\ (mg/ml)}$
1	50 mg	40%	

2	100 mg	34%	101.6209 mg/ml
3	150 mg	27%	
Standard Diclofenac sodium			
1	50 mg	91%	**121.29 mg/ml**
2	100 mg	93%	
3	150 mg	85%	
4	200 mg	89%	
5	250 mg	88%	

DISCUSSION

Various proteins and chemicals combine to form antioxidant resistances, which eliminate and neutralize reactive oxygen species (ROS). The relationship between ROS and tumor improvement is puzzling and varies depending on the context; nonetheless, further research reveals that ROS neutralization may promote tumor growth and metastasis in a variety of cancer types via a number of mechanisms[38]. Additionally, prior highlighted that the egg white denaturation test evaluates a medication or compound's ability to prevent or reduce egg white denaturation, which serves as a sign of its anti-inflammatory capabilities[37]. To obtain unrefined extracts, roots, root bark, stem bark, and leaves underwent maceration using water and ethanol. According to the phytochemical investigation, the examined plant components contained alkaloids, saponins, tannins, phenols, carbohydrates, and proteins[8]. The ethanol extract was found to contain alkaloids, phytosterols, and saponins, while the aqueous extract contained alkaloids, carbohydrates and glycosides, saponins, proteins, and amino acids, according to initial phytochemical research[9]. Phenol, DPPH, and FRAP had a substantial positive link with PC1, while flavonoid and tennis were represented by PC2. According to the findings, phenolics and flavonoids had a strong association with DPPH and FRAP. This research offers scientific proof supporting the presence of biologically active phytochemical components in *M. oblongifolia* root bark extracts[10]. Water extracts of herbs and spices contain significant levels of phenols and flavonoids, which give them the ability to neutralize free radicals in a manner comparable to that of gallic acid[39, 40, 41], the presence of phenolic compounds is what causes the medicinal botanicals to have beneficial antioxidant and anti-inflammatory properties[42]. Furthermore, our research highlights a phenolic-rich multi-herb mixture that has the potential to increase its antioxidant properties. Additionally, research on the ethanolic and aqueous extract of *Maerua oblongifolia* (MRO ET and MROA) has confirmed its ability to combat free radicals, demonstrating its antioxidant capabilities and capacity to alleviate acute inflammation and pain.

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