Supplementary table. Pharmacological activities of different *Cymbopogon* species

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
Cymbopogon ambiguus	Anti-platelet	Whole plants	Dichloromethane extract	2.8×10^{-6} to 2.8×10^{-4} M, 1.7×10^{-4} to 3.5×10^{-3} M	In vitro: platelet aggregation and [14C]-5HT release bioassays	Dose-dependent inhibition of ADP-induced human platelet serotonin release by eugenol and elemicin, with more potent activity of eugenol (IC_{50}=46.6 μm)	[1]
Cymbopogon citratus	Larvicidal	Leaves	Ethanolic and aqueous extracts	5,10,20,30,40 mg/mL	In vitro: larvicidal bioassay against fourth instar larvae of *Culex quinquefasciatus*	Mean mortality of 90% and 100% larvae exposed to aqueous and ethanolic extracts respectively. LD_{50} for ethanolic extract after 24, 48 and 72 h exposure: 2.4, 1.90, and 1.90, respectively	[2]
	Antibacterial	Leaves	Methanolic extract	25–150 mg/mL	In vitro: agar disk-diffusion method	Antibacterial effect against *Bacillus cereus*, *Bacillus licheniformis*, *Pseudomonas aeruginosa* and *Escherichia coli*. The max activity against *B. Cereus* followed by *B. Licheniformis*, *P. Aeruginosa* and *E. Coli*, respectively	[3]
	Antiviral	-	Methanolic extracts	5, 10, 20, 40, 80 and 160 μg/mL	In vitro: cytotoxic assessment by MTT assay; antiviral activity in Huh7it-1 cell infected by DENV	98.9 %inhibition of DENV-2 at dose of 20 μg/mL	[4]
	Insecticidal	-	EO	8.1, 16.2, 31.2, 62.5, 125, and 250 μg/insect	In vivo: toxicity test on thorax of instar nymphs; respiration rate bioassays; locomotion behavior test	↑ Toxicity from first- to fifth-instar nymphs; Irritability or repel of nymphs; tolerability of P*odisus nigrispinus* adults to the EO and its constituents; alteration of respiratory activity with geranyl acetate and irritation and repel by citral	[5]
	Anti-proliferative	Leaves	EO	8 mg/mL	In vitro: DPPH radical scavenging activity; ABTS radical cation decolorization assay; lipoxygenase type I-B inhibiting activity; MTT assay on prostate cancer cell lines (LNCaP and PC-3) and glioblastoma cell lines (SF-767 and SF-763)	Antioxidant activity; lipoxygenase inhibition (98.22%); anti-proliferative activity: IC_{50} for lncap:6.34 mg/mL, for PC-3: 32.1 mg/mL, For SF-767: 45.1 mg/mL and for SF-763:172.1 mg/mL	[6]
	Lipid-lowering	Whole plant	Aqueous extract	250, 500 and 1000 mg/kg	In vivo: Sprague-Dawley rats orally treated with extract; invitro-DPPH assay; Western blot analysis	↓total cholesterol, LDL, atherogenic index, and expression of genes and protein of sterol regulatory element binding protein-1c (SREBP1c) and HMG-COA reductase (HMGR); ↑serum antioxidant capacity	[7]
	Antituberculosis	Leaves	EO	1.250-19.53 μg/mL.	In vitro: REMA microdilution method	Inhibition of the growth of *Mycobacterium tuberculosis*	[8]
	Antibacterial and antifungal	Aerial parts	Methanol extract	200-400 μg/mL	In vitro: antibacterial activity studied by 96 Well Plate Method against *Escherichia Coli*, *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhi*; Antifungal activity studied by Agar Tube dilution against *Trichophyton longifusis*, *Candida albicans*, *Candida glabarata*, *Fusarium solani*, *Microsporum canis*, *Aspergillus flavus*	Antibacterial activity against *Bacillus subtilis* and *Staphylococcus aureus;* no antifungal activity	[9]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Antioxidant	-	Infusion	ND[1]	In vitro: DPPH radical scavenging activity, reducing power, β-carotene bleaching inhibition and lipid peroxidation inhibition by TBARS assay	Higher antioxidant activity than the standard with lower EC_{50} values in the four assays	[10]
	Gastric ulcer healing	Aerial parts	EO	1–100 mg/kg	In vivo: acute ethanol-induced ulcer and chronic acetic acid-induced ulcer in mice In vitro: determination of the H^+,K^+-ATPase activity	↓Ulcer area by EO and geraniol but not by citral; ↑gastric healing process; inhibition of H^+/ K^+- atpase activity by EO and citral	[11]
	Antioxidant and antifungal	Leaves	EO	15.6, 31.2, 62.5, 125, 175,250, 350, 500, 700, 1000 and 2000 mg/mL	Invitro: DDPH assay, broth microdilution method, antifungal activity against *Candida albicans*, *C. tropicalis*, *C. krusei*, *C. glabrata*, *C. parapsilosis* and *C. famata* which were obtained from urine samples of patients admitted to the intensive care unit	MIC:125 to 175 µg/mL (for different *Candida* species; MFC (minimum fungicidal concentration): 175 to 350 µg/mL; Potent radical Scavenging power	[12]
	Anti-memory decline	Leaves	Aqueous extract	25, 50, and 100 mg/kg	In vivo: effect on spatial and non-spatial memory and scopolamine-induced amnesia in male Swiss mice using the Y-maze test (YMT) and objection recognition test (ORT)	↑ % alternation behavior in the YMT and index of recognition memory in the ORT; ↓SCO-induced memory deficits and scopolamine-induced increased acetylcholinesterase activity and alteration of brain levels of MDA and GSH	[13]
	Antioxidant	Leaves	Aqueous, ethanolic and EO	10–500 mg/mL, 1–100 mg/mL, 200 mg/mL	Invitro: DPPH method, ABTS+ method, reducing power assay, hypochlorous acid (HOCl) scavenging assay, the ability to prevent Fe(II)/H2O2 induced deoxyribose decomposition	Great antioxidant activity; the ethyl acetate fraction presented a high polyphenolic content and inhibited TBARS production in phospholipids comparable to vitamin E	[14]
	Antituberculosis	Stems and rhizomes	methanolic extract	200 µg/mL, 1600 µg/mL	Invitro: MIC value against M. tuberculosis H37Rv using a colorimetric tetrazolium microdilution assay; integrity of mycobacterial cells was observed under a scanning electron microscope (SEM)	Reduction of 90.28% in colony count of *M. Tuberculosis* by n-hexane fraction; alteration of normal mycobacterial cellular structure and cell lysis	[15]
	Antidiabetic	Leaves	Aqueous extract	20, 40, 60, 80, 100 µg/mL	Invitro: alpha-amylase inhibitory assay and glucose diffusion-inhibitory assay	Inhibitory effect on the α-amylase in a dose-dependent manner	[16]

[1] Not defined

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Giardicidal	Leaves	Aqueous extract	25,50,100,200,40,500 mg/mL 125,250,500 mg/kg/day	Invitro: DPPH free radical scavenging assay; In vivo: Inducing infection, each mouse received *G. lamblia* cysts by orogastric gavage	The IC_{50} value for scavenging DPPH free radical :16.4 ± 0.1 mg/mL; ↓Giardia trophozoites growth; 100% stool clearance of *G. Lamblia* stages by 500 mg/kg extract similar to metronidazole-treated group; MIC/24 h and IC50/24 h were 500 and 93.8 µg/mL, respectively	[17]
	Mosquito repellents, as inhibitor of the Ross River virus	Leaves	EO	1130 µg/mL	Invitro: determination of the viability of HEK293T cells by an MTT assay after infected by Ross River virus - T48	↓ Cytopathic effect but not displayed virucidal activity; ↓ viral replication and infectivity when applied prior, during and early after viral adsorption	[18]
	Anti-neuroinflammatory	Leaves	low molecular weight polysaccharide fraction	12.5-100 µg/mL	In vitro: Inhibition of lipopolysaccharide (LPS)-induced neuroinflammatory response in raw 264.7 macrophages and U87 glioblastoma cells through MTT assay	↑U87-MG proliferation and viability; ↓induction of nitrite; ↑intracellular ROS; ↓over-expressions of IL-6, IL-1β, NF-kb and TNF-α; ↓production of IL-6 and IL-1β in LPS-induced U87-MG cells by inhibiting NF-κb activation	[19]
	Antiviral	ND	EO	6 to 12 µg/mL, 12 to 25 µg/mL	Invitro: effect of EO on the HIV-1 Tat/TAR-RNA complex by electrophoretic mobility shift assay (EMSA); effects of EOs on Tat-dependent HIV-1 LTR transcription, HL3T1 cell line was used as an experimental model mimicking viral latency reactivation	↓ Viral transcription to 60% when administered at 0.65 µg/mL, IC_{50}:0.61 µg/mL; no effect on band intensity and did not cause a delay in TAR-RNA migration	[20]
	Anti-herpetic	Leaves	EO	250µg/mL	Invitro: HSV-1 and HSV-2 titer reduction	Very high inhibitory potential against both viral types	[16]
	Anti-inflammatory and antioxidant	Leaves	Flavonoids-rich ethyl acetate extract	100 mg/kg	In vivo: sodium nitrite (NaNO2) induced oxidative stress in male albino Wistar rats	↑Serum protein, WBC count, GSH level, CAT and SOD activities and ↓MDA levels	[21]
	Anticancer	Stems	Ethanolic and aqueous extracts	80 mg/kg/day	In vivo: lymphoma xenograft model in immunocompromised CD-1male mice In vitro: cytotoxicity of extracts on various Hodgkin and non-Hodgkin's lymphoma cell linesmy using watersoluble tetrazolium-1 (WST-1) assay, annexin V binding assay and propidium iodide staining fluorescent JC-1 assay	↓ Tumor growth in human lymphoma xenograft models, ↓ viability of lymphoma cell lines in a dose-dependent manner; Induction of apoptosis in lymphoma cells And no observable apoptotic induction in normal human fibroblast cells; mitochondrial depolarization, ↓ rates of oxygen consumption in lymphoma cells; induction of ROS production in several blood cancer cell lines	[22]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anticlastogenic	Bulbs and leaves	Decoction	0.5 mL/20 g of body weight	In vivo: clastogen-induced female albino rats by tetracycline; genotoxicity was studied by micronucleus test	↓ Micronucleated polychromatic erythrocytes; not any adverse effects such as tachycardia, arrhythmia and hyperpnea detected	[23]
	Anti-inflammatory and antioxidant	Leaves	Methanolic extract	100 mg/kg	In vivo: male albino Wistar rats intoxicated with sodium nitrite	↑Serum protein, WBC, GSH, CAT and SOD activities and ↓ serum TP,TNF-α, CRP, and MDA	[21]
	Antioxidant and cytoprotective	Leaves	EO	25–100 µg/mL	Invitro: DPPH assay, phosphomolybdenum assay, itric oxide scavenging activity, superoxide anion scavenging assay, reducing power assay, hydrogen peroxide scavenging assay, MTT assay, LDH leakage assay, nitrobluetetrazolium (NBT) reduction assay, TBARS assay	Greater antioxidant property than L-ascorbic acid; free radical scavenging and cytoprotective activity	[24]
	Anti- trypanosomal	-	EO	100 and 250 mg/kg	In vivo: Swiss mice were inoculated with metacyclic trypomastigotes of *Trypanosome cruzi* Y-strain	Week activity	[25]
	Antibacterial	Leaves and stems	EO	0.125 to 8 mg/mL	In vitro: agar diffusion, broth microdilution method	Highly active against *S. Aureus* and *E. Coli*; no significant activity against non-fermentative Gram-negative bacilli, *A. Baumannii*, and *P. Aeruginosa*	[26]
	Antifungal	Leaves	EO	0.1 to 0.5µg /mL	Invitro: disc diffusion technique, determination of MIC studied by semisolid agar antifungal susceptibility method, dermatophytes and keratinophilic fungi including *Trichophyton rubrum, T. verrucosum, T. mentagrophytes, Microsporum gypseum* and *Candida albicans* were isolated from infected skin scrapings of *Tinea* patients	Maximum zone of inhibition was against *Trichophyton mentagrophytes* Followed by *T. Rubrum, Microsporum canis, M. Fulvum, C. Albicans, M. Gypseum* And *Fusarium verticillioides*	[27]
	Hepatoprotective and antioxidant	Whole plant	Ethanolic extract	1000 mg/kg/day	In vivo: paracetamol hepatoxicity-induced Sprague-Dawley rat model	↓Hepatic markers (AST and ALT); ↑GSH and ↓MDA	[28]
	Antidepressant	Leaves	Aqueous extract	10, 25 and 50 mg/kg	In vivo: forced swim test (FST), tail suspension test (TST) and yohimbine-induced lethality test (YLT) in mice	Antidepressant-like activity devoid of significant stimulation of the spontaneous motor activity via involvement of noradrenergic, serotonergic, and monoaminergic systems	[29]
	Topical anti-inflammatory	Leaves	lipid-and EO-free infusion	1mL of final formulation	In vivo: carrageenan-induced rat Paw edema model	Significant reduction of edema volume	[30]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Antimalarial	Whole plant	Plant powder	600 and 3200 mg/Kg	In vivo: mice with a patent *Plasmodium chabaudi* AS or *P. berghei* ANKA infection	Suppression of parasitaemia , antimalarial activity against both species; higher antimalarial activity of low dose than high dose against *P. Berghei* ANKA; As a prophylactic treatment, higher antimalarial activity of whole plant than herbal infusion or chloroquine; higher activity of combination of whole plant and chloroquine than chloroquine alone against *P. Berghei* ANKA; better temperature regulation by *C. Citratus* than group treated with CLQ and that treated with the combination of *C. Citratus* and CLQ; higher survival rate of *C. Citratus* than that treated with the combination of *C. Citratus* and CLQ	[31]
	Antioxidant, anti-inflammatory and anti- bacterial	Leaves	Ethanolic extracts	0.01-10mg/mL	Invitro: DDPH test and DNA protection test; albumin denaturation, HRBC membrane stabilization, anti-proteinase and heat induced hemolysis; microtitre well dilution method against *Staphylococcus aureus* and *S. pyogenes*	Antioxidant and anti inflammatory activity; MIC90 values: 0.557 and 0.330(mg/mL) against *S.aureus* and *S.pyogenes* respectively	[32]
	Anxiolytic	ND	EO	Inhalation of three or six drops aroma	Human study-40 male volunteers exposed to an experimental model of anxiety, the video-monitored version of the Stroop Color-Word Test (SCWT) after inhalation of EO	↓ Anxiety and subjective tension in 5 min	[33]
	Antifungal	ND	EO	ND	Invitro: broth macrodilution method, In vivo: topical antifungal activity studied in cyclophosphamide induced immunity suppressed rat, irritation effect: Draize patch test on albino rats	Significant antifungal activity against *C. Albicans* with MIC and MFC of 2 and 8 µl/mL, respectively; no erythema or edema of hydrogel formulation on the shaved rats' skin. ↓ CFU/mL values by topical formulation after 2 days of treatment	[34]
	Anti-allergic and cytotoxic	Leaves	hexane extract	60, 120 or 180 mg/kg	In vivo: murine model of respiratory allergy to the mite *Blomia tropicalis* in A/J mice, MTT colorimetric method	↓Bt-specific IgE, IgG1 and IgG2a in the serum of mice sensitized with Bt antigen; ↓leukocytes/eosinophils and eosinophil peroxidase activity in BAL; ↓infiltration of leukocytes in lung tissue; ↓production of mucus in the respiratory tract; ↓IL-4 in BAL and the nuclear expression of NF-κb	[35]
	Gastroprotective	Leaves	EO-free infusion	28 or 56mg/kg of	In vivo: acute gastric lesions induced by ethanol in Wistar rat	In the prevention groups: ↓number and severity of gastric lesions; in the treatment group: ↓ Ulcer index	[36]
	Aldose reductase inhibitory and antioxidant	-	petroleum ether extract	75 µg/mL	In vitro: DPPH and FRAP assays; aldose reductase enzyme inhibitory assay; Invivo: streptozotocin-induced diabetic Wistar rats	Citronellol: 90.4% inhibition of aldose reductase (IC_{50} value: 19.6 ±0.8 µg/ mL); antioxidant activity; ↓sorbitol (44%) in the eye lens study	[37]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Erythropoiesis boosting	Leaves	Infusion	2, 4 and 8 g/day	Human study: clinical trial,105 subjects	↑ Pcv, hb, And RBC no change in MCH, MCV, and MCHC; ↓ WBC and differentials without any changes in neutrophils and lymphocytes	[38]
	Diuretic	Leaves	Infusion	2, 4, and 8 g /day	Human study: pre-experimental and postexperimental design in 105 participants	↓CCR and EGFR at day 30 in in all the groups. At day 10, no change in CCR and EGFR in those treated with infusions whereas ↑diuretic indices (urine volume, urination frequency, diuretic action, and saliuretic indices); ↑Serum and urinary creatinine and Serum urea in all groups; no change in serum electrolytes but ↑urinary electrolytes	[39]
	Antitumor and immunomodulatory	Aerial part	polysaccharide fraction	30,50,100 and 200 mg/kg/d	Invitro: colorimetric MTT assay. In vivo: mice were implanted with cell suspension containing S180 tumor cells into the right armpit to induce tumors	Inhibition of growth of transplanted S180 cells with the Inhibition rates ranging from 14.8 to 37.8%; dose-dependent improvement of the immunity of the tumor-bearing mice. With dose of 200 mg/kg/d, ↑thymus and spleen indices; ↑cona- and LSP-induced splenocyte proliferations; ↑IL-2, IL-6, IL-12, and TNF-α	[40]
	Growth inhibitor of oral pathogens	Leaves and twigs	EO	1%, 0.1%, and 0.01%.	In vitro: broth dilution methods	Inhibition of the growth of *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans, Streptococcus mutans, Lactobacillus acidophilus*	[41]
	Anti-inflammatory and Analgesic	Leaves	Infusion and flavonoid-rich and tannin-rich fractions	34.12 mg /kg, 68.24 mg/kg, 3.71mg/kg, 7.42 mg/kg, 2.98 mg/kg and 5.96 mg/kg	In vivo: carrageenan-induced rat paw edema model; hot plate test; acetic acid-induced writhing test	Edema inhibition, ↓ pain reduction; ↓inflammation and peripheral pain	[42]
	Hepatoprotective	Leaves	aqueous extract	100 mg/kg	In vivo: hydrogene peroxide-liver injury in male rats	↓ALT, AST, ALP, LDH, TB, and MDA in serum and liver homogenates; ↑TP and GSH levels in serum and liver homogenates; improvement of liver histo-pathological changes	[43]
	Anti-inflammatory	Leaves	Methanolic extract	0.625, 1.25, 2.5, and 5 µg/mL	In vitro: incubating PBMCs with the sample and then stimulating by lipopolysaccharide; enzyme-linked immunosorbent assay; standard Trypan blue exclusion method	Inhibition of the release of IL-1β with IC50 = 3.22 µg/mL	[44]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anti-allergic and anti-inflammatory	ND	EO	10,100 µg/mL 500 µg/ear	In vitro: rat basophilic leukemia (RBL-2H3) cells treated with the calcium ionophore A23187; RAW264.7 murine macrophages treated with lipopolysaccharide. In vivo- immunoglobulin E (IgE)-induced passive cutaneous anaphylactic (PCA) reaction in mice and a 12-O-tetradecanoylphorbol-13-acetate-induced inflammatory mouse ear edema	>40% inhibition of mast cell degranulation; >50% inhibition of TNF-α production. Inhibition of the release of β-hexosaminidase and TNF-α production and LPS-induced NF-κb nuclear translocation by citral and geranial. Inhibition of PCA reaction in the mice by EO, citral and geranial; suppression of inflammation by pre-treatment with 500 µg/ear of these compounds as follows: geranial > lemongrass > citral	[45]
	Antifungal	ND	EO	1.25 µL/mL	Human study: phase I (20 volunteers) and II (47 volunteers) clinical studies in patients with pityriasis versicolor for 40 days	No significant adverse events during phase I. In phase II, after 40 days of treatment, the rate of mycological cure was 60% for the group treated with EO and over 80% for the group treated with ketoconazole formulations	[46]
	Protective effect on reproductive system	Leaves	Aqueous extract	100 mg/kg	In vivo: hydrogen peroxide (H2O2)–induced oxidative stress and injury in the reproductive system of male rats	↑ Body, testicular, and epididymal weight, testosterone, The values of the various sperm characteristics, and GSH; ↓ MDA in serum and testes homogenates, as well as testicular histopathological alterations in the h2o2-treated rats	[47]
	Neuroprotective	ND	EO	100 µg/mL	In vitro: glutamate-induced cell damage in a primary culture of rat cerebellar granule neurons; MTT assay	↑Cell viability by treatment with EO before, during, and after exposure to glutamate; ↓ Necrotic rate; antiapoptotic activity in cerebellar granule neurons due to Cell cycle arrest in G0G1 phase	[48]
	Renal protective	ND	Ethanolic extract	200 mg/kg/day	In vivo: gentamicin-induced nephrotoxicity in male rabbits	Protection from alteration in body weight, blood urea nitrogen, serum creatinine, creatinine clearance, serum uric acid, serum electrolytes, urinary volume, urinary protein, urinary lactate dehydrogenase, urinary alkaline phosphatase, and histology of kidney induced by gentamicin	[49]
	Antidiabetic	Leaf sheath	EO	400 or 800 mg /kg	In vivo: poloxamer-407 induced type 2 diabetic Wistar rats	Amelioration of glycaemia, insulinemia and lipid dysmetabolism, accompanied by increased GLP-1 content in cecum; Histopatholgical analysis of pancreas showed increase in β-cell mass, islet number and quality of insulitis; ↓hba1c and TBARS, ↑GSH levels, total thiol, GST,SOD and catalase	[50]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anticancer	leaves	EO	500 mg/kg /week	In vivo: hyperplastic lesions in the mammary gland, colon, and urinary bladder induced by N-methyl-N-nitrosourea (MNU) in female BALB/c mice	↓ Target organ cytotoxicity (cell proliferation and apoptosis responses) in colonic crypt and bladder urothelial epithelial cells; ↑apoptosis in mammary epithelial cells ↓ early development of proliferative/preneoplastic lesions; ↓ deleterious effects of mnu exposure detected by the lower cell proliferation index in the urinary bladder and the lower apoptotic index in both the colon and urinary bladder; ↓cell proliferation in the mammary gland, resulting in a protective action against mammary hyperplasia development; modulation of the colonic and urothelial cytotoxicity	[51]
	Vasorelaxant	Leaves, stems, and roots	Methanolic extract	1, 3, 10, 30 and 100 mg/mL	In vitro: spontaneously hypertensive rats and Wistar Kyoto Rat; phenylephrine (PE)- induced contraction	Dose-dependent relaxant effect of citral, LE (leaves extract), and RE (root extract) on the PE-induced contractions; citral, LE, and RE abolished the restoration of PE-induced contraction caused by the addition of increasing doses of calcium in both endothelium intact and denuded rings; citral may partially act through the NO pathway while a vasodilator prostaglandin may mediate the effect of LE	[52]
	Cardioprotective	Aerial parts	Eethanol and water extract	200 mg/kg	In vivo: isoproterenol-induced cardiotoxicity in male Wistar albino rats	Cardioprotective activity by extract pretreatment as evidenced by ↓activity of cardiac markers (CKMB, CK, LDH, GOT and GPT) in serum and ↑ the same in heart homogenate;↓ toxic events of lipid peroxidation (TBARS) in both serum and heart tissue, by increasing the level of enzymatic antioxidants (like SOD, catalase, gpx and GST) and non-enzymatic antioxidants (GSH,vitamin C and vitamin E) significantly in both heart homogenate and serum sample	[53]
	Antifungal	Leaves	EO	2% Shampoo formula	Invitro: broth dilution assay	Anti-malassezia activity with MFC after one week at room temperature = 75 µg/mL and at 45ºc = 18.75 µg/mL.	[54]
	Hypotensive and Vasorelaxant	ND	EO	1–20 mg⁄kg	In vivo: non-anaesthetized Rats	Induction of hypotension associated with tachycardia; in intact rings of rat mesenteric artery pre-contracted with phenylephrine, citronellol induced relaxations that were not affected by endothelium removal; citronellol strongly antagonized contractions induced by cacl2; citronellol inhibited the contractions induced by phenylephrine or caffeine	[55]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anxiolytic	Leaves	EO	5,10,50 mg/kg 500, 1000 and1500 mg/kg	In vivo: light/dark box (LDB) and marble-burying test (MBT); forced swimming test (FST) in mice	Anxiolytic-like activity at the dose of 10 mg/kg in a LDB via the GABA-A receptor benzodiazepine complex; In the FST and MBT, ↑ time spent in the light chamber	[56]
	Spasmolytic	Leaves, Stems, and roots	Methanolic extract	0.001-1 mg/mL	In vitro: isolated rabbit ileum In vivo: Ach-induced interaction and KCL-induced interaction	↓ ACH- and KCL-induced ileal contractions by citral and extract of leaves via acting as calcium antagonists. Furthermore, the relaxant effect of citral, but not that of the leaf extract may be mediated by nitric oxide	[57]
	Effect on locomotor activity	ND	EO	0.1, 0.3, and 0.5 mL	In vivo: wheel cage for mice	↓ Mice locomotor activity by EO, citronellol and citronellal in a dose-dependent manner; citronellal was a dominant compound in the blood plasma of mice after inhalation of EO	[58]
	Anti-tyrosinase and antioxidant	Stems	EO	ND	In vitro - mushroom tyrosinase was examined by means of the dopachrome method using L-dopa as an enzymatic substrate. Antioxidant activity was gauged by the free radical scavenging activity test (or ABTS assay) and ferric reducing/antioxidant power assay	High level of antityrosinase activity 69 ± 4%. antioxidant activity with respect to mechanisms of both free radical scavenging and reducing activities.	[59]
	Acetylcholinesterase and butyrylcholinesterase inhibitor	Aerial parts	EO	Microemulsion containing 10 % EO	In vitro: Ellman's colorimetric method	High activity with IC_{50} = 0.34 µl/mL and 2.14 µl/mL against BCHE and ACHE activity, respectively	[60]
	Anticonvulsant	Leaves	EO	50,100,200 mg/kg	In vitro: human neutrophils In vivo: pentylenetetrazol/ pilocarpine / strychnine -induced convulsion and, barbiturate-induced sleeping time on male Swiss mice	More active on the pentylenetetrazol-induced convulsion model; ↑latency to the first convulsion and latency to death which were potentiated in the presence of a lower dose of diazepam; blockage of anticonvulsant effects by flumazenil; ↑barbiturate-induced sleeping time; blockage of MPO release from human neutrophils	[61]
	Oral thrush healer	ND	Infusion	250 mL twice a day	Human study: a randomized controlled trial in 90 HIV/AIDS patients for11days according to oral thrush scale	Better efficacy and lower number of adverse events than gentian violet	[62]
	Hypoglycemic and hypolipidemic	Leaves	Aqueous extract	125-500 mg/kg	In vivo: normal, male Wistar rats for 42 days	↓Fasting blood sugar and lipid parameters dose dependently; ↑HDL-c; no effect on triglycerides level	[63]
	Antiplatelet	-	EO	1-300 µg/mL	In vitro: guinea pig and rat plasma	Block clot retraction induced by thrombin	[64]
Cymbopogon densiflorus	Antioxidant	Leaves	EO	0.5 to 50 mg/mL	In vitro: DPPH and ABTS methods	DPPH: IC_{50} =14.689mg/mL and ABTS:0.567 mg/mL	[65]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Antimicrobial	leaves and inflorescences	EO	250, 500, 1000 ppm	In vitro: macro broth dilution method a gainst *Staphylococcus aureus*, *S. agalactiae*, *S. pyogenes*, *Entrococcus faecalis*, *Bacillus subtilis*, *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *P. fluorescens*. *Streptococcus pneumoniae*, *Salmonella typhi*, *S. paratyphi A*, *Klebsiella pneumoniae*	Activity against most of the tested bacterial strains; Gram-positive bacteria being more sensitive than Gram-negative ones; mics were found to be between 250 and 500 ppm for the Gram-positive and between 500 and 1000 ppm for the Gram-negative bacteria. The growth of *P. Mirabilis* and *E. Faecalis* was inhibited at 1000 ppm	[66]
Cymbopogon distans	Antibacterial and antifungal	Leaves	EO	1000-1.95 µg/mL	In vitro: filter paper disc diffusion assay, micro dilution broth assays against *Staphylococcus aureus*, *S. epidermidis*, *Streptococcus mutans*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Candida albicans* and *Candida kefyr*	Activity against all bacterial strains (MIC: 250–1000 µg/mL) and three fungal strains (MIC: 130–530 µg/mL).	[67]
Cymbopogon flexuosus	Antimicrobial	Leaves	EO	50, 100, 250 and 500 µL/mL	In vitro: disc diffusion method	Significant inhibition for *Escherichia coli*, no inhibition for *Bacillus cereus* and *B. Subtilis*, inhibition zone of 50, 27, 35 mm for *Candida albicans*, *Aspergillus fumigatus*, *Saccharomyces cerevisiae* respectively; total inhibition against *Aspergillus niger*; the best MIC values against all bacterial strains with 2.5 µl/mL for all the studied bacteria except 5 µl/ mL for *S. Aureus*	[68]
	Antioxidant and anticancer	Aerial parts	Ethanolic extract	62.5–750 µg/mL	In vitro: human hepatocellular carcinoma cell lines (HepG-2) and adenocarcinomic human alveolar basal epithelial cell line (A-549)	Antioxidant activity; ↓carcinoma cells growth; inducing apoptotic cell death through stimuli of caspase-3 and caspase-9	[69]
	Hepatoprotective	ND	EO	200-400 mg/kg	In vivo: male Sprague-Dawley rats	EO and citral: ↓ hepatic testosterone 6b-hydroxylation and ethoxyresorufin O-deethylation activities. ↑NADPH:quinone oxidoreductase 1 activity by citral; ↑ UDP glucurosyltransferase activity by EO in the rat liver;↓lipid peroxidation and reactive oxygen species levels in the liver by EO and citral. After acetaminophen treatment, however, EO and citral treatment resulted in little or no change in plasma alanine aminotransferase activity and acetaminophen-protein adducts content in the liver	[70]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anti-inflammatory	ND	EO	0.0012% (v/v)	In vitro: pre-inflamed human dermal fibroblasts	Inhibition of production of the inflammatory biomarkers vascular cell adhesion molecule 1 (VCAM-1), interferon gamma-induced protein 10 (IP-10), interferon-inducible T-cell alpha chemoattractant (I-TAC), and monokine induced by gamma interferon (MIG); ↓ tissue remodeling biomarkers collagen-I and III, epidermal growth factor receptor (EGFR), and plasminogen activator inhibitor (PAI-1); and inhibition of immunomodulatory biomarker macrophage colony-stimulating factor (M-CSF); modulation of global gene expression and robustly impacted signaling pathways	[71]
	Anti-dandruff	ND	EO	5, 10 or 15% of EO	Clinical trial: a randomized, double-blind, placebo-controlled, split-head	↓ Dandruff	[72]
	Lipoxygenase inhibitor, antioxidant, and antimicrobial		EO	ND	In vitro: lipoxygenase inhibition assay, DPPH assay and β-carotene-bleaching assay. agar dilution, broth dilution, and poisoned food method	Inhibition of lipoxygenase activity by 51% at 12.5 µg/mL, lipoxygenase inhibitory activity was highest in the citronellal (IC_{50} value 1.66 µg/mL); DPPH radical scavenging: IC_{50} (µg/mL): 660.2;B-carotene bleaching IC50 (µg/mL): 125.50; great antimicrobial activity against *Klebsiella pneumonia*, *Bacillus cereus*, *B. Subtilis*, *Staphylococcus epidermidis*, *S. Aureus*, *Malassezia furfur* and *Aspergillus parasiticus*	[73]
	Antifungal	Leaves and stems	EO	ND	In vitro: agar well diffusion assay against *Trichosporon ovoides*	MIC :25 µl/mL MFC :50 µl/mL	[74]
	Analgesic and Anti-inflammatory	Leaves	EO	50, 100, 200 mg/kg	In vivo: acetic acid- induced writhings test, tail flick test, Carrageenan-induced rat paw edema method, chronic. Cotton pellet-induced granuloma in rats	↓ Acetic acid–induced writhing; no effect on tail flick response due to the hot water-induced noxious stimuli; antiphleogestic activity; ↓ weight of granuloma	[75]
Cymbopogon giganteus	Antimicrobial	Leaves	EO	10–0.075 mg/mL	In vitro: disc diffusion and microdilution methods against *Escherichia coli*, *Enterobacter aerogenes*, *Enterococcus faecalis*, *Listeria monocytogenes*, *Pseudomonas aeruginosa*, *Salmonella enterica*, *S. typhimurium*, *Shigella dysenteriae*, and *Staphylococcus aureus*	Antimicrobial effects against all microorganisms	[76]
	Anti-inflammatory and analgesic	Leaves	EO	40 -192 µg/mL	In vitro: soybean lipoxygenase L-1 and cyclooxygenase	The best inhibition on lipoxygenase L-1 at t1/2 value of 15 min with 77 µg/mL at 30 °C but it had no effect on cyclooxygenase	[77]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
Cymbopogon goeringii	Antioxidant and for skincare	Leaves	EO	ND	Invitro: superoxide anion radical scavenging assay, ABTS cation radical scavenging assay, lipid peroxidation assay, Nano-TiO2–NO2–UV induced protein oxidation and tyrosine nitration scavenging assay	IC_{50}=150 µg/mL for O2 and 500 µg/mL for ABTS; appreciable inhibitory lipid peroxidation activity; protection of bovine serum albumin against UV–tio2–NO2-induced protein oxidation and tyrosine nitration injury	[78]
Cymbopogon jwarancusa	Anti-hyperlipidemic and anti-hyperglycemic	Aerial parts	Ethanolic extract	150, 300 and 500 mg/kg	In vivo: high-fat high-sugar diet model in Sprague-Dawley male rats	↓ In body weight. ↓ in total cholesterol, triglycerides, LDL and blood glucose, ↓ atherogenic index	[79]
	Antimicrobial	Aerial parts	EO	16-0.0125 µl/mL	In vitro: disc-diffusion and microbroth dilution assays; DPPH assay	Best antimicrobial activity against *Bacillus cereus*, *Staphylococcus epidermidis* and *Streptococcus pneumonia*; inhibitory effect against *Bacillus subtilis* and *Candida albicans*	[80]
	Cytotoxic and antioxidant	Aerial parts	EO	5, 10, 30, 50 and 100µg/mL 20, 40, 60, 80 and 100 µg/mL	In vitro: cytotoxicity on human cancer cell lines THP-1 (leukemia), A-549 (lung), HEP-2 (liver) and IGR-OV-1 (ovary) by Sulphorhodamine-B assay; DPPH assay	IC_{50} of 6.5 µg/mL (THP-1), 6.3 µg/mL (A-549), 7.2 µg/mL (HEP-2) and 34.4 µg/mL (IGR-OV-1); potent antioxidant activity	[81]
	Antioxidant and antimicrobial	Leaves	Ethanol and aqueous extract	0.25 0.50 1.00 2.00 mg/10 mL 100,200,500ppm	In vitro: DPPH and FRAP assay, β -carotene linoleate bleaching (βCL) assay, food poison Technique against *Aspergillus flavus, Fusarium oxyporum, Staphylococcus aureus, Streptococcus salivarius*	Ethanol extract showed highest antioxidant activity in DPPH (31.99 % inhibition) and FRAP (38.79 Fe (II) micromole per litre) assay while water extract showed highest antioxidant activity in βcl (54. %) at 1mg/10ml concentration; ethanol extract was very effective against *Fusarium oxyporium* and *Staphylococcus aureus* at 500 ppm while water extract was found less effective against *Aspergillus flavus* at 100 ppm concentration	[82]
	Anti malarial	Aerial parts	EO	ND	In vitro: in each 400 mL beaker 25 of 4thinstar larvae of Anopheles were exposed tothese concentrations at different replicates	Activity against larvae of *Anophel stephensi*	[83]
Cymbopogon martini	Antimicrobial	Aerial parts	EO	0.1%	In vitro: *Borrelia burgdorferi* culture went into stationary phase (~10^7 spirochetes/mL), followed by evaluating potential anti-persister activity of EOs in a 96-well plate	Residual viability (%) after 0.1% EO treatment = 35 ± 5	[84]
	Antibacterial		EO	1, 5 and 10µg/mL	In vitro: Resazurin broth microdilution assays; RNA-binding assay against *Cutibacterium acnes*	MIC was 0.7 to 1.6 mg/mL for the three main *C. Acnes* types. There were no cytotoxic effects of compounds in the absence or presence of *C. Acnes*	[85]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Topical antimicrobial	Aerial parts	EO	0.65 to 10 μg/mL	In vitro: agar well diffusion and agar dilution assay against *Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus pyogen, Aspergillus niger Candida albicans, Microsporum canis, Trichophyton mentagrophytes, Trichophyton rubrum, and T. verrucosum*; skin sensitizations of the formulations were evaluated using guinea pig maximization	Broad-spectrum antimicrobial potency against all tested organisms with MIC value ranging from 0.65 to 10 μg/mL ,Antifungal against T. Mentagrophytes and *T. Rubrum* at concentrations above 1%of oil and against *M. Canis* and *T. Verrucosum* at concentration of 4% oil. Hydrophilic and macrogol blend ointment containing 5% oil did not produce any skin sensitization on guinea pigs	[86]
	Estrogenic	ND	EO	ND	In vitro: hormone-dependent (MCF-7) and -independent (MDA-MB-231) breast cancer cell lines using the sulforhodamine-B assay	Stimulating ER+ cell growth and ERE-luciferase reporter activity to levels seen with premenopausal estradiol concentrations	[87]
	Antifungal	ND	EO	2 µl/mL to 3 µl/mL	Invitro: disc diffusion technique and semisolid agar method against *Trichophyton rubrum, T. mentagrophytes, T. tonsurans, Microsporum canis, M. fulvum, Candida albicans*	Maximum activity against *T. Mentagrophytes* followed by *M. Fulvum* and *T. Rubrum;* Minimum inhibitory concentration was ranged from 2 µl/mL to 3 µl/mL against tested fungi	[88]
	Hepatoprotective	ND	EO	13.73mg EO/L of air for 10 minutes every 48 hours	In vivo: Wistar rats	No effect on glycemia and triacylglycerol levels; ↓ Cholesterol by geraniol and EO; no effect on serum protein, urea, aspartate aminotransferase activity, and total hepatic protein; ↑Creatinine and alanine aminotransferase by geraniol but ↓ by EO. Alanine aminotransferase activity and lipid hydroperoxide were higher in geraniol than EO. Catalase and superoxide dismutase activities were higher in EO than geraniol. ↑glutathione peroxidase by EO and geraniol	[89]
	Bronchodilator, vasodilator and spasmolytic	Leaves	Methanolic extract	ND	In vitro: isolated rabbit jejunum preparations; isolated rabbit tracheal preparations; isolated rabbit aorta preparation	Methanolic extract: relaxation of on jejunum through ↓ magnitude and frequency of spontaneous contractions; relaxant effect on high K^+-induced contractions in isolated rabbit jejunum preparations; dichloromethane and aqueous fractions: concentration-dependent relaxation in spontaneous and K^+-induced contraction of jejunim; relaxant effect on tracheal preparation which is mediated through antimuscarinic and/or $Ca2^+$ channel blocking activities; relaxant effect of extract against phenylephrine- and K-induced aorta contractions	[90]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Neuroprotective		EO	50 mg/kg and 100 mg/kg	In vivo: global ischemic brain damage induced by bilateral common carotid artery (BCCA) occlusion for 30 min, followed by 60 min reperfusion on Wistar albino rats	Treatment prior to occlusion markedly reversed biochemical/enzymatic alterations including ↑ LPO and ↓SOD, CAT, total thiols and GSH and restored to normal levels; protection of histology of brain against ischemic damage	[91]
	A-Glucosidase inhibitor	Whole plant	Aqueous extract	5.0 mg/kg	In vitro: α-glucosidase from Yeast and α-amylase from *Aspergillus oryzae* and α-glucosidase isolated from rats In vivo: streptozotocin-induced diabetic rats	Toluene: ethyl acetate fraction showed optimum Alpha Glucosidase inhibitory activity. The silica gel chromatography fraction demonstrated 98, 98, and 68% inhibition for starch, maltose, and sucrose, respectively; Intestinal absorption studies using non-everted intestinal sacs, as well as in vivo studies in streptozotocin-induced diabetic rats using oral glucose tolerance with maltose and sucrose load, revealed better inhibition of alpha glucosidase as compared to acarbose;	[92]
	Antigenotoxic and antioxidant	ND	EO	50, 100 and 200 µg/mL	In vitro: the antigenotoxic effect on human lymphocyte cells using trypan blue dye exclusion test, plasmid pBR322 DNA strand scission, and comet assay. Antioxidant activity by DPPH+ free radical scavenging and lipid peroxidation assay	Antigenotoxic activity against methyl methanesulphonate (MMS) and hydrogen peroxide; dose dependent antioxidant activity	[93]
	Monoamine oxidase (MAO) inhibitor and antioxidant	Leaves	Ethanol extract	100–500 lg/ mL	In vitro: rat brain mitochondrial MAO; DPPH	Inhibition of MAO activity with competitive mode of inhibition; significant radical scavenging (IC_{50} = 0.34 mg/mL) and reducing activity (IC50 = 0.70 mg/mL)	[94]
Cymbopogon nardus	Antibacterial		EO	0.5 mg/mL	In vitro	Reduction of the biofilm biomass of *Staphylococcus aureus* up to 100%	[95]
	Insect repellent	Whole plant	n-hexane extract	31.25-1000 ppm	In vitro: oviposition deterrent and adult emergence inhibition activities against *Culex quinquefasciatus* mosquito	During the oviposition deterrent activity, the 1000 ppm concentration of extract showed maximum (71.9%) effective repellence (ER). The lowest concentration (31.25 ppm) caused 13.43 % ER. During the adult emergence inhibition (EI) activity, it restricted adult emergence (EI_{50} = 515.2 ppm)	[96]
	Antioxidant and antibacterial	Leaves	EO	100- 2000 µg/mL	In vitro: DPPH assay, microdilution method against *Staphylococcus aureus*, Bacillus *subtilis*, *B. cereus*, *Pseudomonas aeruginosa* and *Escherichia coli*	Antioxidant activity with EC_{50}= 2.44 µg/mL; antibacterial activity against the tested Gram positive and Gram-negative bacteria. The minimum inhibitory concentration of the EO ranged from 250 µg/mL to 1000 µg/mL	[97]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Anti-candidiasis, anti-inflammatory and Wound healer	Leaves	EO	25 mg/day	In vivo: streptozotocin-induced diabetic Swiss albino mice with full thickness excisional wound infected by *C. albicans* inoculums. Invitro: agar well diffusion method inoculated with *C. albicans*,*C.glabrata* and *C. tropicalis*	Inhibition of the growth of all the *Candida* species tested; eradication of *C. Albicans* colonization on diabetic wounds; ↓levels of inflammatory cytokines like TNF-α and IL-1β healing the wounds confirmed by observation of fibro collagenase sub epidermal tissue with normal skin adnexal structures like hair follicles and sweat glands with mild cell	[98]
	Anti- inflammatory	ND	EO	15 μg/mL	In vitro: cytotoxicity using MTT assay and Effects on IL-1β-Induced proinflammatory mediators by human gingival fibroblasts	IC_{50}= 50 μg/mL; no effect on baseline secretion of IL-6, IL-8, and PGE2 but ↓in IL-1β-induced IL-6; ↓IL-1β-induced IL-8 secretion; synergistic effects with IL-1β on the secretion of PGE2	[99]
	Antifungal	Leaves	EO	10-1000 µg/mL	In vitro: microplate dilution technique against 20 samples of *Candida* spp.; cytotoxicity against HepG-2 (hepatic) and MRC-5 (fibroblast) cell lines	Antifungal activity against all strains tested with MIC values ranging from 250 to 1000 µg/mL, except for two clinical isolates of C. Tropicalis (MIC > 1000 µg/mL; inhibition of the growth of the yeast and hyphal formation of *C. Albicans* strains at concentrations ranging from 15.8 to 1000 µg/mL; inhibition of mature biofilms of strains of *C. Albicans*, *C. Krusei* and *C. Parapsilosis;* IC50=96.6 µg/mL for hepg-2 and 33.1 µg/mL for MRC5	[100]
	Anti-inflammatory	Leaves and flowers	EO	1 mL of 2% EO	In vivo: egg albumin-induced paw edema	Significant anti-inflammatory effects from the first 30 min after albumin injection compared to aspirin which had a later onset of effect	[101]
	Weight lowering	Leaves	EO	Inhalation of EO diluted 100× in water	In vivo: high fat diet fed male adult Sprague-Dawley rats	↓ Feed consumption; ↓percentage of weight gain; ↓the blood cholesterol level	[102]
Cymbopogon nervatus.	Spasmolytic	Stems and inflorescences	EO	30, 60 and 90 µg/mL 10–200 µg/mL	Invitro: DPPH assay, effect against spontaneous contractions, and contractions induced by ACh and KCl,	Strong, significant and concentration-dependent spasmolytic activity at concentration of 200 µg/mL, the oil showed 88.44% of maximal spasmolytic effect of atropine against spontaneous contraction; inhibition of ach-induced contractions at 90 µg/ml and ↓ effect of the highest applied concentration of ach to 37.29%. Strong activity against contractions induced with KCL (80 mm) and in concentration of 200 µg/mL, completely abolished the contractile effect of kcl. Moderate anti-DPPH activity	[103]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Antibacterial	Inflorescence	EO	200 µl/well	Invitro: well diffusion method against *Staphylococcus aureus; Bacillus subtilis;Escherichia coli;Pseudomonas aeruginosa; Salmonella typhi; S. paratyphi A; S. paratyphi B;Shigella dysentriae; Sh. Flexeneri; Sh. Boydii;Proteus mirabilis; Klebsiella pneumoniae*	Inhibition of the growth of all tested clinical isolate bacteria with the exception of *Salmonella typhi*	[104]
Cymbopogon pospischilii	Antimicrobial and anticancer	Leaves	EO	5,25,75,125,250,500,1000 µg/mL	In vitro: micro-well dilution method against *Bacillus cereus, Enterococcus faecalis, Listeria monocytogenes, Staphylococcus aureus, and four Gram-negative bacteria: Escherichia coli, Klebsiella pneumonia, Salmonella typhimurium* and *Pseudomonas aeruginosa*; Cell Titer-Blue cell assay on human Chang liver cells	Active against the growth of Gram positive than the Gram negative bacterial tested. LD_{50}= 81.66 of toxicity at 24 h	[105]
Cymbopogon schoenanthus	Anti-nephrotoxic, anti-inflammatory and antioxidant	Leaves	Aqueous extract	2, 1, 0.5, 0.25, 0.125 mg/mL	In vitro: CCL4-induced toxicity in African green monkey; renal epithelial cells (Vero, American Type Culture Collection "ATCC", CCL-81)	Suppression of CCL4-induced oxidative stress by scavenging the reactive oxygen species, ↑ cellular antioxidant indices, ↓ccl4-induced inflammation by inhibiting the gene expression of NF-κb, NOs, and the level of nitric oxide, improvement of the morphological appearance of Vero cells, cellular necrosis, and the gene expression of kidney injury molecule-1	[106]
	Antioxidant, antimicrobial and insecticidal	Aerial parts	EO	10, 20,40 and 80 µl/mL 33.3 µl/mL	In vitro: DPPH assay, disc diffusion method against *Staphylococcus aureus, Bacillus subtilis, Escherichia coli*, and *Candida albicans*; Female fecundity and eggs hatchability against cowpea weevil (*Callosobrochus maculatus*)	Antimicrobial against all strains except *E. Coli*; weak antioxidant activity; the piperitone-rich EO showed the highest effectiveness against the cowpea weevil with the potent reduction of the female's fecundity and the hatchability of laid eggs	[107]
	Immunomodulatory	Leaves	hydroalcoholic extract	100 mg/kg	In vivo: cadmium- induced toxicity in Swiss albino mice	Pretreatment with extract: ↑hemoglobin, RBC and hematocrit and ↓WBC, bilirubin, AST, ALT, ALP and gamma-glutamyl transpeptidase (GGTP)	[108]
	Free radical scavenger, α-glucosidase inhibitor and lipase inhibitor	Whole plant	ethanol and water extracts	ND	In vitro: DPPH assay, α-glucosidase inhibitory and pancreatic lipase inhibitory assays using 96-well microplate. cytotoxicity and genotoxicity on HeLa cell line using HCS DNA damage Assay	SC_{50} (µg/mL) for DPPH radical scavenging activity for ethanol extract: 201.88 and for water extract: 333.99; IC_{50} (µg/mL) for α-glucosidase inhibition for water extract: 282.37 and ethanolic extract showed no inhibition; IC_{50} (µg/mL) for pancereatic lipase inhibition for ethanolic extract: 16.69 and for water extract: 18.43	[109]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Spasmolytic	Stems and inflorescence	EO	10-130 µg/mL	In vitro: effect of oil against spontaneous contractions, contractions induced by acetylcholine and contractions induced by potassium chloride on mesenteries of Wistar rats	Strong, significant and dose-dependent spasmolytic activity	[110]
	Anti-hypopigmentation	Leaves	Ethanolic extract	ND	In vitro: B16 murine melanoma cells and human epidermal melanocytes (HEM); MTT assay; melanin Assay	↑Melanin content of the cells by upregulating the expression of tyrosinase (TYR), tyrosinase-related protein 1 (TRP1), and dopachrome tautomerase (DCT) at the protein and mrna levels, comparable to the effect of α-melanocytestimulating hormone (MSH), in both B16 cells and HEM. Modulation of at least 44 pigmentation-associated genes including the microphthalmia-associated transcription factor (Mitf) and its transcriptional regulators	[111]
	Antibacterial	ND	EO	1-150 µg/mL	In vitro: agar well diffusion and dilution methods	Effective against *Escherichia coli*, *Staphylococcus Aureus* and *Klebsiella pneumoniae*. Not effective against *Staphylococcus saprophyticus* at the highest concentration	[112]
	Antiproliferative, antioxidant and antibacterial	leafy stems	EO	0.5- 400.0 µg/mL 200 µg/mL 1 µg/mL	In vitro: anti-proliferative against human cell lines (MCF7 and MDA-MB231, HT29 and HCT116) by MTT assay. Antioxidant activity by DPPH assay. Antibacterial activity by microdilution method	Anti-proliferative activity against HCT116 cell line with IC_{50} =19.1 µg/mL; Good antibacterial activity against *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* with MIC value ranged from 16 to 250 µg/mL; no radical scavenging activity	[113]
	Antihypertensive	Aerial parts	methanolic extract	50,100 mg/kg	In vivo: Nω-Nitro-L-arginine methyl ester (L-NAME)-induced hypertensive rats	Dose-dependent decrease in the blood pressure of hypertensive rats,no appreciable Hypotensive effect on normotensive animals in the tested dose levels, Methanolic extract and n-hexane fraction caused a transient decrease in blood pressure of about 8% at 100 mg/kg dose after 2 weeks of treatment	[114]
	Anti-stress	Leaves	Ethanolic extract	100,200mg/kg	In vitro: H2O2-induced cytotoxicity and stress in human neuroblastoma SH-SY5Ycells, HSP47 Assay Invivo – tail suspension test and forced swimming test in ICR Mice	Pretreatment of SH-SY5Y cells with Extract at 1/2000, 1/1000, and 1/500 v/v dilutions significantly inversed H2O2-induced neurotoxicity; significantly reversed heat shock protein expression in heat-stressed HSP47-transformed cells and mRNA expression of HSP27 and HSP90 in H2O2-treated SH-SY5Y; ↓immobility time In forced swimming and tail suspension tests; significant regulation of blood serum corticosterone and cerebral cortex levels of catecholamine (dopamine, adrenaline, and noradrenaline)	[115]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Bronchodilator, anti-inflammatory	ND	EO	0.3 ml/kg	In vivo: cardiac parasympathetic ganglia in rats, the intra-tracheal pressure in guinea-pigs and on carrageenan-induced inflammation in the rats paw	The percentage protective effect of the oil on the vagus-induced bradycardia in rats was 90.1 %; antagonize; the actions of 5-HT and histamine by 80 and 93 %, respectively. Pre-treatment in doses of 0.1 and 0.3 ml/kg (i.p.) 1 h before injection of carrageenan reduced the induced edema	[116]
	Insecticidal	Leafy stems	EO	ND	Invitro: *Anopheles gambiae*	95% Knock down in mosquito's population	[117]
	Anthelmintic	ND	EO	0.018-22.75 mg/mL 18.2-136.5 mg/mL	In vitro: efficacy against developmental stages of trichostrongylids from sheep naturally infected (95% Haemonchus contortus and 5% Trichostrogylus spp.) through the egg hatch assay (EHA), larval development assay (LDA), larval feeding inhibition assay (LFIA), and the larval exsheathment assay (LEA)	The best activity against ovine trichostrongylids. LC_{50}=0.045 mg/mL in EHA 0.063 mg/Ml in LDA, 0.009 mg/ml in LFIA, and 24.66 mg/ml in LEA	[118]
	Hypoglycemic	ND	Aqueous extract	1.5 mL/kg	In vivo: alloxan-induced diabetic rats	Restored the elevated blood glucose level to the normal level. ↓ hepatic activity of cytochrome p450, NADPH-cytochrome c reductase, AHH, NDMA-DI, GST and GSH. ↓ activity of cytochrome p450 system	[119]
Cymbopogon winterianus	Antimicrobial	Leaves	EO	50,100,250,500 µL/mL	In vitro: disc diffusion method	Good inhibition for *E. coli* followed by *B. cereus* and *B. subtilis;* also effective against *Staphylococcus aureus, Salmonella typhimurium, Aspergillus niger Aspergillus fumigatus Saccharomyces cerevisiae* and *Candida albicans*	[68]
	Antifungal	ND	EO	19.5- 40000µg / mL	In vitro: microdilution method	Great antifungal activity against *Candida albicans* (MIC:625 µg/mL), *C. Tropicalis* (MIC1.25 µg/mL), and *C. Krusei* (MIC:2.5 µg/mL)	[120]
	Antinociceptive	Leaves	EO	50–200mg/kg	In vivo: Formalin-, capsaicin-, and glutamate-induced orofacial nociception	↓Orofacial nociceptive behavior; ↓Fos-positive cells was in the dorsal raphe nucleus, locus coeruleus, trigeminal nucleus, and trigeminal thalamic tract; no change in motor coordination in the rota-rod test	[121]
	Antinociceptive	Leaves	EO	25, 50 and 100 mg/kg	In vivo: spontaneous locomotor activity assessed in a cage activity; motor coordination test (rota-rod test); pentobarbital-induced hypnosis, acetic acid-induced writhing; capsaicin-induced nociception	Inhibitory effect on the locomotor activity of mice; antinociceptive effect by increasing the reaction time in the writhing and capsaicin tests; ↑ sleeping time of animals but not modified latency; no alteration in the remaining time of animals on the rota-rod apparatus	[122]

Supplementary table. Continued

Plant	Pharmacological activity	Plant part	Plant extract	Evaluated dose/ concentration	Method	Result	Ref.
	Cardioprotective	Leaves	EO	1–20 mg/kg 0.1–3000 mg/mL	Invitro: K^+-induced tonus in isolated rat superior mesenteric artery rings In vivo: nonanaesthetized and anaesthetized rats	Induction of dose-dependent hypotension and tachycardia in rats which were partially reduced after atropine administration; induction of bradycardia-associated sinoatrial blockade, junctional rhythm, and first-degree atrioventricular block, which was abolished after atropine administration or vagotomy; induction of relaxation of phenylephrine tonus in arterial rings that was not affected by removal of the endothelium; antagonization of cacl2-induced contractions in depolarizing solution (kcl)	[123]
	Antibacterial	ND	EO	0–100 µL/mL	In vitro: broth microdilution method, pour plate method against *Propionibacterium acne*	MBC= 0.625mL/mL	[124]
	Antinociceptive, anti-inflammatory and antioxidant	Leaves	EO	50, 100, and 200 mg/kg	In vitro: DPPH assay In vivo: Acetic acid-induced writhing, formalin test, hot-plate test, carrageenan-induced neutrophil migration to the peritoneal cavity	↓ number of writhings and paw licking times in the first and second phases, respectively in the acetic acid-induced writhing and formalin tests; no alteration in the latency time for mice licking the rear paws in hot-plate test; inhibition of carrageenan-induced neutrophil migration to the peritoneal cavity in a dose-dependent manner; High scavenging activity toward DPPH radicals with an IC_{50} = 12.66 µg/mL	[125]
	Anticonvulsant	Leaves	EO	100, 200 and 400 mg/kg	In vivo: pentylenetetrazol (PTZ), picrotoxin (PIC)-induced convulsion in mice; strychnine (STR)-induced convulsion	Depressant activity on CNS. ↓ number of animals exhibited PTZ- and PIC-induced seizures in 50% of the experimental animals. ↑ latencies of clonic seizures induced by STR	[126]
	Insecticidal	ND	EO	ND	In vitro: *Aedes aegypti* larvicidal bioassay	LC_{10}, LC_{50} and LC_{90} index of A. *Aegypti* larvae exposed to plant: 56 (48, 62), 98 (89, 107), 172 (151, 206) respectively	[127]

ACT: Acetylcholine; AChE: acetylcholinesterase; ALT: Alanine transaminase; AST: Aspartate transaminase; Beta-CL: beta carotene linoleate bleaching; BCCA: bilateral common carotid artery; BChE: butyrylcholinesterase; CAT: catalase; CCr: creatinine clearance rate; CLQ: chloroquine; CRP: C reactive protein; DCT: dopachrome tautomerase; DENV-2:Dengue virus; EC50: Half maximal effective concentration; EGFR: epidermal growth factor receptor; eGFR: estimated glomerular filtration rate; EHA: egg hatch assay; EMSA: electrophoretic mobility shift assay; EO: essential oil; FST: forced swimming test; EO: essential oil; FST: forced swim test; DPPH: 2,2-diphenyl-1-picrylhydrazyl; FRAP: ferric reducing antioxidant power; GGTP: gamma-glutamyl transpeptidase; GSH: glutathione; Hb: hemoglobin; HbA1c:Hemoglibin A1c; HDL: high density lipoprotein; HIV: human immunodeficiency virus; HMG-coA : 3-hydroxy-3-methylglutaryl-CoA; HSV: Herpes simplex virus; IC50 half maximal inhibitory concentration; IE50: 50% emergence inhibition; IgE: Immunoglobulin E; IgG: Immunoglobulin G; IL: interleukin; I-TAC: interferon-inducible T-cell alpha chemoattractant; LD50: Median lethal dose; LDA: larval development assay; LDB test: light/dark box test; LDH: lactate dehydrogenase; LDL: low density lipoprotein; LEA: larval exsheathment assay; LFIA: larval feeding inhibition assay; L-NAME: : Nω-Nitro-L-arginine methyl ester; LPS: lipopolysaccharide; MAHD: microwave assisted hydrodistillation; MAO: Monoamine oxidase; MASHD: microwave assisted steam distillation; MBC: minimum bactericidal concentration; MBT: marble-burying test; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; MCSF: macrophage colony-stimulating factor; MCV: Mean corpuscular volume; MDA: malondialdehyde; MFC: minimum fungicidal concentration; MIG: monokine induced by gamma interferon; MITF: microphthalmia-associated transcription factor; MMS: against methyl methane sulphonate; MTT :3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide; NADPH: Nicotinamide adenine dinucleotide phosphate; NBT: nitrobluetetrazolium; ND: not determined; Nf kappa: nuclear factor kappa; NO pathway: nitric oxide pathway; ORT: objection recognition test; PAI: plasminogen activator inhibitor; PCV: packed cell volume; PGE2:prostaglandin E2; PTZ: pentylenetetrazol; RBC: red blood cell; REMA: resazurin microtiter assay; ROS : reactive oxygen species; SCO: scopolamine; SCWT:

Stroop Color-Word Test; SEM: scanning electron microscope; SOD: superoxide dismutase; SREBP1C: sterol regulatory element binding protein-1c; STR: strychnine; TBRS: Thiobarbituric Acid Reactive Substances; TNF: tumor necrosis factor; TP: total protein; TST: tail suspension test; TRP: tyrosinase-related protein; VCAM: vascular cell adhesion molecule; WBC: white blood cell; WST: water-soluble tetrazolium; YLT: yohimbine-induced lethality test; YMT: Y-maze test; ↑: increase; ↓decrease

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