

الوصف النباتي والتركيب الكيميائي والتأثيرات العلاجية لنبات المرسين

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وأمنة المهدي لحضيري ، وأمنة صالح القذافي ، وإيمان ضو امحمد .

الملخص:

ستسلط هذه المراجعة على المكونات الكيميائية ، وهي وصف تفصيلي للشكل والتأثيرات الدوائية والعلاجية لنبات *Myrtu L. communis*. هذا النبات هو عشب دائم الخضرة من العائلة الكافورية *Myrtaceae* , ينتشر على نطاق واسع في جميع أنحاء العالم. حيث كانت نسبة الكربوهيدرات (88,69%) والبروتين الخام (5,97%) والزيت الخام (3,59%) ومحتوى الرطوبة (63,67%) وإجمالي الرماد (1,75%) بالإضافة إلى أنه يحتوي على عناصر معدنية ومحتويات نشطة بيولوجيا . وله العديد من الأنشطة الدوائية مثل : مضادات الجراثيم , مضادات الفطريات , مضادات السرطان , مضادات الفيروسات , مضادات الأكسدة ومضادات السكر والحماية الكبدية والعصبية ، وما إلى ذلك من مستخلصات نباتية مختلفة.

Myrtus communis L.phytochemistry, ethnobotany and pharmacology: A review

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Abstract

This review will highlight the chemical constituents and detail description of morphology and the pharmacological and therapeutic effects of *Myrtus communis*. This plant commonly known as myrtle, is an evergreen and aromatic herb of the family *Myrtaceae*, it is widely distributed throughout the world. *M. communis* was reported to contain carbohydrates (88.69%), crude protein (5.97%), crude oil (3.59%), moisture content (63.67%) and total ash (1.75%) and mineral elements and many other bioactive contents. Many

pharmacological activities viz., antibacterial, antifungal, anticancer, antiviral, antioxidant, antidiabetic, hepatoprotective and neuroprotective etc. have been reported in different plant extracts.

Keywords: *Myrtus communis* L., pharmacological activities, chemical constituents, ethnobotany, traditional uses.

Abbreviations

DPPH, 2,2-diphenyl-1-picrylhydrazyl; bw, body weight; ABTS, 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid; i.p., Intra-peritoneal injection; ER, Oesophageal Reflux; MJB, Myrtle Berries Juice; HSV-1, Herpes Simplex Virus-1; CQ, Chloroquine, FRAP, Ferric Reducing Antioxidant Power Assay; MIC₅₀, Minimal Inhibitory Concentration.

Introduction

Myrtle (*Myrtus communis*) of the Myrtaceae family is an evergreen and aromatic shrub with numerous branches and stems [1]. Myrtaceae family contains 3,000 species naturally growing in subtropical and tropical regions. [2,3] It is native to North Africa, Southern Europe and West Asia. It is distributed in Southern America, Australia and North western Himalaya and widespread in the Mediterranean region [2].

For a long time, different parts of this plant such as branches, berries, leaves, seeds and fruits have been extensively used in traditional medicine in various doses form to treat haemorrhoids, diarrhoea, palpitations, conjunctivitis, peptic ulcers, leucorrhoea, pulmonary and skin disorders [4,5,6]. In addition to use as antibacterial, antifungal, anticancer, antiviral, antioxidant, antidiabetic, hepatoprotective and neuroprotective [5].

M. communis contained coumarins, myricetin, myrtucommulone A and B, myrtenol acetate, Myrtenol, limonene pinene, geraniol, p-cymene, phenylpropanoid, methyl eugenol phospholipids, phenolic compounds and essential oil [7,8].

Taxonomic Hierarchy

- Kingdom: Plantae
- Division: Spermatophytes
- Sub-Division: Angiosperms
- Class: Dicotyledone

- Order: Myrtales
- Family: Myrtaceae
- Genus: *Myrtus*
- Species: *communis* [9]

Common Names

- South Arabia: Habb-ul-Aas, Hadass
- China: Xiang tao mu
- English: Myrtle
- Greek: Mirtia
- Italy: Mirto
- Persian: Barg-e-murad (leaves)
- Russia: Mirt
- Turkey: Mersin
- Urdu: Aass, Moorad
- Hindi: Sata Sova, Vilayati mehndi
- Sanskrit: Gandhamalati [10]
- Libya: Mersin [9]
- Iraq: Yas [11]

Botanical Description (Figures 1-5)

Leaves: are glossy, glabrous, dark green, 2.5-3.8 cm long, opposite, coriaceous, paired or whorled, ovate, lanceolate with stiff structure, aromatic.

Stem: 2.4-3 m high, its branches form a close full head, thickly covered with evergreen leaves.

Fruits: Berries are pea-sized, orbicular or oved ellipsoid, blue-black or white whit hard kidney. The developed fruit is initially pale green, then turns deepred and finally becomes dark indigo when fully mature. They are bitter when unripe, sweet when ripe.

Seeds: Varying shapes and sizes 0.7-1.2 cm, the glabrous berry has rounded (vase-like) shaped with a swollen central part and remnants of persistent 4-5 partite calyx at the outer part [12-17].

Flowers: Star-like, white, with five sepals, five petals with glands and somewhat tomentose margin covered with fine hairs and a tufted mass of stamens [10].

Nutritional Value

Myrtus communis is a rich source of carbohydrates (88.69%), crude protein (5.97%), crude oil (3.59%), moisture content (63.67%) and total ash (1.75%) [18]. It contained mineral elements such as, calcium, sodium, potassium, magnesium, phosphorus, iron, zinc, aluminium, copper and lead [19].

Traditional uses

The leaves are useful in cerebral diseases especially epilepsy, stomach diseases [20,21], dyspepsia, liver diseases, rheumatism [21, 22], aphthae, eczema, pulmonary disorders [20,23], piles, sores [22], intertrigo, wounds, ulcers [24], stomatitis, deep abscesses, uterine prolapse, leucorrhoea, internal ulceration, haemorrhage [25], inflammation, diarrhoea, hair fall, burns, herpes, palpitation, menorrhagia [26], chronic bronchitis [27], abscess, sprain, diaphoresis [24] and chronic catarrh of bladder [27,28]. Various pharmacological actions of leaves are astringent, antiseptic [24], hypoglycaemic, laxative [27], analgesic [22,29], haemostatic [29], hair tonic [26] and stimulant [24].

Decoction of leaves and fruits is utilized orally for the cure of disbiosis, hypoglycaemia, stomachaches, cough constipation, poor appetite, externally for wound healing, urinary infections, enema and against respiratory diseases [30,31].

The berries are used in diarrhoea, dysentery, internal ulceration, rheumatism [22,21] foot ulcers, foetid ulcers, aphthae, deep abscesses, haemorrhages, leucorrhoea, lax vaginal walls [24], bronchitis [22], haemorrhoids [22], malaria, rhinitis, rectitis, conjunctivitis, piles, burns, dysuria, cough, epistaxis [29], earache, toothache, headache, palpitation [31], otorrhea [24], sprain, fractures, fever, polydipsia, burning micturition, scorpion sting, dandruff, melasma chloasma, menorrhagia, haemoptysis, uterine prolapse, rectal prolapse, eye ulcers, halitosis (bad breath), head, ulcers, vomiting, inflammations and gastric ulcer [32]. They are used as antiseptic, astringent [24], carminative [20,22,24], emmenagogue [22,24], demulcent, dessicant, analgesic, hair tonic, haemostatic [26], antiemetic, lithotriptic [33], cardi tonic, diuretic [22,29,33], anti-inflammatory [3], stomachic, brain tonic [22,33], haemostatic, nephroprotective, antidote [3], antidiaphoretic [29] and antidiabetic [27]. Different parts of the plant have been used in the food

industry, for example for flavouring meat and sauces, and in the cosmetic industry [27, 34].

In Turkish folk medicine, the fruits and leaves have been used in the treatment of urinary diseases, for healing wounds and as an antiseptic [35]. The oil of leaves and dried leaves of the plant are used to lower blood sugar in diabetic patients. In the Mediterranean regions, the tea is used to treat urinary tract infections and bladder [36]. In Libya, the plant is used for the treatment of cough, bronchitis, tuberculosis, lung complaints [37].

Chemical constituents

M. communis contains many active biological compounds which contribute significantly to the medicinal properties of the plant. Table 1 summarizes the active constituents recorded from different parts of *M. communis*.

Table 1: Chemical constituents of *M. communis*

Constituents	Plant part	Reference
• Acylphlorogucinols: Mytrucommulone B,C,D,E and usnic acid derivative usnone A.	The aerial parts	[38]
• Tannins, flavonoids such as quercetin, catechin and myricetin derivatives and volatile oils. • Alpha-pinene, 1V8-cineole, limonene and linalool.	The leaves	[35,39] [40]
• The five terpenoid compounds (myrtenyl acetate, 1, 8-cineole, limonene, linalool).	Leaf oil	[41]
Couenstitnts	Plant part	Reference
• Citric acid, malic acid, resin, tannin, fixed oil and sugar. • Flavonoids, anthocyanin arabinosides, anthocyanin glucosides. • Kaempferol, quercetin, myricetin 3-o-glucoside,	Berries	[42,43] [44] [45]

myricetin 3, 3-di-o-galactoside, myricetin 3 rutinoside, aesculin, scopoletin, caffeic acid.		
Myricetin 3-o-rhamnoside or myricitrin, esculetin-6-o-glucoside or esculin, hesperetin 7-o-rhamnoglucoside or hesperidin, hesperetin-2-o-methylchalcone-4-o-rhamnoglucoside.	Berries	[46]
- The five terpenoid compounds (myrtenyl acetate, 1, 8-cineole, limonene, linalool). - Flavonoids, such as alpha-pinene, 1V2-cineole, myrtenal, myrtenol, myrtenyl acetate, myrcene, Linalool and geraniol.	Flowers	[41] [47]
- Volatile oils, tannins, sugars, flavonoids and organic acids such as citric and malic acids. 14 fatty acids, oleic acid being the dominant fatty acid followed by palmitic acid and stearic acid. - Flavonoids such as asquercetin, catechin, myricetin.	Fruits	[35,33] [30] [48]
- Tannins. - Alkaloids, glycosides, reducing sugars - Fixed oil. - Gallic acids, phenolic acids, quercetin and patuletin.	Roots	[31] [25] [21] [49]
Couenstitnts	Plant part	Reference
- Ellagic acid and ellagitannins(eugeniflorin D₂ and oenothain B) - Fatty oil (fixed oil) consisting of glycerides of oleic, linoleic, myristic, palmitic, linolenic and lauric acid	Seeds	[50] [20,51]

Pharmacological activities

M. communis is reported for antimicrobial, antioxidant, Anticancer, Anti-inflammatory, Cardiovascular, Antidiabetic, Antinociceptive, Antidiarrheal Antiviral, Anthelmintic and other beneficial effects which are mentioned in Table 2.

Table 2: Pharmacological activities of *M. communis*

Activity	Dose	Extract/ Constituent	Model	Results	Reference
Antioxidant	DPPH: (4±0.3 to 21±0.1 g/ml), ABTS: 0.001 50±0.000 09 to 0.004 80±0.000 08 mg/ml	Methanol, chloroform, ethyl acetate and aqueous extracts	ABTS, DPPH, Hydroxyl radical scavenging activity, Metal chelating activity β- carotene/li noleic acid bleaching assay, , Reducing power,Ferr ic thiocyanat e test, <i>in vitro</i>	Ethyl acetate extract exhibited the highest activity in scavenging DPPH, ABTS, hydroxyl radical and reducing power	[52]
	In lipid peroxidat ion IC ₅₀ : 160µg/ml and 220 µg/ml DPPH IC ₅₀ : 1.4µg/ml	Myricetin-3- ogalactoside and - rhamnoside, isolated from the leaves	Xanthine oxidase, lipid peroxidatio n and DPPH/ <i>in vitro</i>	Both compounds showed the most potent inhibitory effect in xanthine oxidase	[53]
Activity	Dose	Extract/ Constituent	Model	Results	Reference
Antioxidant	3 to5 grams	Fruit extract	DPPH and β	Protect against	[54]

			-carotene- linoleic acid assays	lipid peroxidatio n and can scavenge free radicals	
	1 ml	Methanol of roots	DPPH, FRAP and Folin- Ciocalteu assays	This extract exhibited very good radical- scavenging activity.	[55]
Cardiovas cular	0.04 to 12 mg/kg bw	Methanolic and ethyl acetate extracts of berries	In anaesthetiz ed rats. Intravenou s administra tion of both extracts	Decreased the maximum mean arterial blood pressure at 12 mg/kg, indicated that both extracts have lowering effect for blood pressure	[52]
	Relaxed phenylep hrine (1 μ M) and K ⁺ (80 mM)- induced contracti ons	Crude methanol extract	Isolated rabbit aorta preparatio ns	Results were identical to verapamil, a standard calcium channel blocker	[56]
Anti- inflammato ry	0.3-10 μ g/ml	Ethanolic extract of leaves	6-keto- prostaglan din F1 α and [3H]- arachidoni c acid	Significant anti- inflammato ry activity at the maximum	[57]

			metabolite production in keratinocytes	concentration	
Activity	Dose	Extract/ Constituent	Model	Results	Reference
Anti-inflammatory	1 and 2 ml/kg	Essential oil	Croton oil induced ear oedema and cotton pellet induced granuloma in mice	1. Significant ↓ ear oedema 2. Inhibit cotton pellet-induced granuloma and serum TNF- α and IL-6	[58]
Anti-inflammatory	0.5 to 4.5 mg/kg i.p.	Myrtucommulone (isolated from leaves)	Carrageenan-induced paw oedema and Pleurisy in mice	1. ↓ the growth of paw oedema in a dose-dependent manner 2. At 4.5 mg/kg i.p. myrtucommulone exerted potent anti-inflammatory effects in the pleurisy model	[59]
Anticancer	(1 and 3 μ g/ml)	Ethanolic extract	<i>In vitro</i> on HaCat keratinocytes by using the BrdU incorporation assay	The result showed that extract inhibit keratinocyte proliferation by 27% (1	[60]

				$\mu\text{g/ml}$) and 76% (3 $\mu\text{g/ml}$)	
		Essential oils	In two human cell lines HL-60 and NB4	Is more effective on Ehrlich Ascites Carcinoma Cells in both <i>in vitro</i> and <i>in vivo</i> studies	[61]
Activity	Dose	Extract/Constituent	Model	Results	Reference
Antibacterial	10,20, 40&80mg/ml	Hydroalcoholic of the leaves	Four pathogenic bacteria, <i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> , <i>Vibrio cholera</i> & <i>Escherichia coli</i>	The concentration of 80mg/ml showed the greatest effect on the <i>S. aureus</i> and <i>V. cholera</i>	[1]
Antibacterial	10 μl	Ethanollic and petroleum ether of fruits	<i>Enterobacter faecalis</i> , <i>Shigella Sonni</i> , <i>Micrococccus leutus</i> , <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i>	Ethanollic extract showed antibacterial activity against <i>E. faecalis</i> , <i>S. aureus</i> . Petroleum ether extract had no effect on tested bacteria.	[18]
	7.5 - 60 mg/ml	Essential oil of fruits	<i>Bacillus cereus</i> ,	It had a strong	[18]

			<i>Micrococccus leutus</i> , <i>Staphylococcus aureus</i> , <i>Shigella Sonni</i> , <i>Aeromonas hydrophilla</i>	antimicrobial effect on most tested bacteria specially on <i>A. hydrophilla</i> then <i>S. sonni</i>	
	1 and 3mg/ml	Myrtacine (Ethanolic extract of leaves)	<i>Erythromycin</i> in sensible (<i>EryS</i>) and resistant (<i>EryR</i>) <i>P. acnes</i> strains	Compared with erythromycin, Myrtacine activity was much higher on the <i>EryR</i> strain	[57]
Activity	Dose	Extract/Constituent	Model	Results	Reference
Antiviral (antiherpetic)	IC ₅₀ before cellular attachment 3.1 mg/ml, and after entering the cells 1.11 mg/ml	Hydroalcoholic extract	The target was Herpes simplex virus-1 (HSV-1) <i>In vitro</i>	By increasing the extract concentration, percentage of inhibition of cytopathic effect was increased	[40]
Anti-diarrhoeal	100, 200 and 400 mg/kg	Methanol extract	Castor oil induced diarrhoea in mice	At dose 200 & 400 mg/kg, the extract significantly delayed the onset of diarrhea	[62]
	5 and 10 ml/kg bw	MBJ	Castor oil-induced	Acute pre-treatment	[63]

	orally		diarrhoea in rat	with MBJ delayed the onset of diarrhea and also decrease the frequency and severity of defecation	
	25 to 100 mg/kg bw orally	Aqueous extract of berries	Castor oil- induced diarrhoea in rat	The extract induced a significant dose- dependent protection against diarrhoea and intestinal fluid accumulation	[64]
Activity	Dose	Extract/ Constituent	Model	Results	Reference
Antidiabetic	500 to 1000 mg/kg bw orally	Aqueous and methanolic extracts	Alloxan- induced diabetic mice	Aqueous extract significantly lowered mean blood glucose level at dose of 500 mg/kg by 61.8%	[65]
	2 g/kg orally	Ethanol- water extract	Streptozotocin- induced diabetes in mice	Significantly reduced the hyperglycaemia	[66]
Antinociceptive	Aqueous extract: 5 to 200	Aqueous and	Hot plate and	Both extracts showed	[67]

	mg/kg i.p., Ethanolic extract: 150 to 350 mg/kg i.p.	Ethanolic Extracts of aerial parts	writhing tests in mice	Significant antinociceptive activity against acetic acid induced writhing and in Hot plate test	
	50 to 150 mg/kg i.p.	Essential oil	Acetic acid induced writhing test in mice	The oil showed dose dependent analgesic effect in comparison with diclofenac sodium	[68]
Anti-plasmodial	1–100 µg/ml	Essential oils	Chloroquine (CQ)-sensitive and resistant strains of <i>P. falciparum</i>	Significant activity present against CQ-sensitive and the resistant strains of <i>P. falciparum</i>	[69]
Activity	Dose	Extract/Constituent	Model	Results	Reference
Anti-helminthic	0.78 to 50 mg/ml	Ethanolic and water extracts of leaves	<i>In vitro</i> naturally infected cattle using the egg hatch and larval mortality assay	Both extracts have a potential anthelmintic activity on eggs and larvae of bovine strongly parasites	[70]

Oesophag eal reflux (ER)		- Aqueous extract of seeds	ER- Induced damage in oesophagea l mucosa of adult male Wistar rats	- Aqueous extract exerted a potential protective effect against ER- induced damage in rat oesophagus due to its antioxidant properties	[71]
Antifungal	20 mg/ml	Flavonoids, Terpenoids, of the leaves	<i>Aspergillus</i> species	The highest percentage of inhibition (85%) was recorded at 20 mg/ml of Flavonoids	[11]
	Dose- dependen t manner with MIC ₅₀ < 8 to 64 µg/ml.	Oenothain B isolated from seeds	<i>In vitro</i> <i>Candida</i> strains: <i>C. albicans</i> <i>C. glabrata</i> <i>C. parapsilosis</i> <i>C. tropicalis</i>	Oenothain B was able to inhibite the <i>Candida</i> growth.	[72]

Figure 1: *M. communis* plantFigure 2: Flowers of *M. communis*



Figure 3: Leaves of *M. communis*



Figure 4: Seeds of *M. communis*



Figure 5: Berries of *M. communis*



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