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MYRTUS COMMUNIS LINN AND POTENTIAL HEALTH BENEFITS: A NARRATIVE REVIEW

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ABSTRACT

Background: Myrtus communis L. It is used in traditional medicine to treat many diseases. In this study, the pharmacological properties and ethnobotanical uses of Myrtus communis l. were compiled. Summary: Searching from science direct and pubmed. Studies after 2000 were included in the study. Scanning was done twice by the authors. Myrtus communis L., which has a high antioxidant capacity, has anti-cancer properties, antimicrobial effects, anti-inflammatory effects and anti-diabetic effects. It also has a protective effect on the cardiovascular system, epidermis and urogenital system. Thanks to its various pharmacological properties, Myrtus communis L. can be used in the production of supplements and drugs as a preventive and therapeutic from diseases. However, further studies are needed to understand all the mechanisms.

KEYWORDS: Myrtus *communis* L., anticancer, epidermis health, cardiovascular health, diabetes.

1. General Characteristics of Myrtle Plant

Medicinal plants have been used for treatment throughout history. Myrtus L. (Myrtaceae family) consists of two species, Myrtus communis L. which grows in the Mediterranean basin and Myrtus nivellei Batt (Saharan myrtle)(Bouzabata et al., 2016). Myrtus communis L. is native to Southern Europe, North Africa, and Western Asia. Different parts of this herb show anti-inflammatory, antidiabetic and antiseptic properties (Jabri et al., 2018). Myrtus communis L. has been used in therapy, food, and spice since ancient times. Both leaves and fruits of the plant are rich in phytochemicals. The flowers of the plant are white, star shaped. The flowers appear from June to September. The fruits ripen in November and are yellowish white or dark blue. Both the flowers and fruit of the plant are edible. As Scientific Classification of Plants in Myrtle in Turkey and Found the Taxon was shown in Table 1.

Table 1: As Scientific Classification of Plants in Myrtle in Turkey.

Kingdom	Plants
Subkingdom	Vascular plants
Superdivision	Seed plants
Division	Flowering plants
Class	Dicotyledons
Subclass	Rosidae
Order	Myrtales
Family	Myrtaceae
Genus	Myrtus L.

Resource:("United States Department of Agriculture Natural Resources Conservation Service," 2021).

METHODS

We used Pubmed and Science Direct for our review. In search, we used this keyword (myrtle or myrtus communis linn or myrtle seeds) and (health or therapeutical activity or pharmacological activity or phytochemisty or ethnobotanical uses). We only used studies published after 2000. We found 1134 aerticles from Science Direct and 125 articles from Pubmed. We included studies explaining the chemical properties of myrtus, its ethnobotanical uses and its relationship with health.

2. Chemical constituent of Myrtle

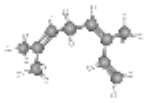
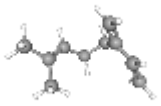
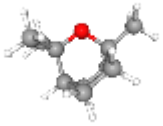
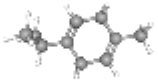
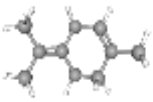
Myrtucommulone A and semimyrtucommulone are among the main components of the myrtle plant. 1,8-cineol, α-pinene, myrtenyl acetate, limonene, linalool and α-terpinolene are among the main biologically active ingredients. Various parts of this plant, such as the fruits, leaves, and berries, have been widely used

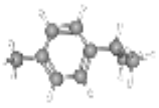
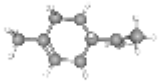
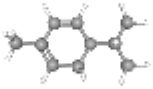
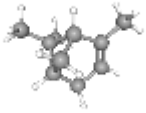
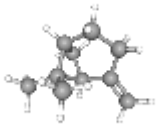
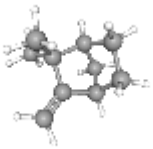
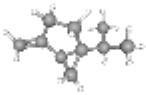
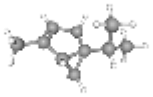
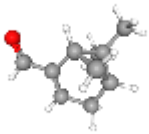
therapeutically by the public for several centuries (Mimica-Dukić et al., 2010) (Alipour et al., 2014). In a study, the essential oil content of Iranian myrtle populations was evaluated. High variation in essential oil content and morphological characteristics was obtained between populations. The essential oil content ranged from 1.06% to 2.28%(Ghafouri and Rahimmalek, 2018). Table 2 shows the components of the plant. On the other hand, the phytochemical contents of leaves of M. communis L. differ from different geographical origins and cultivars (D'Urso et al., 2019).

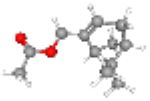
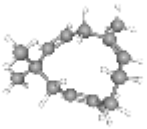
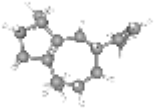
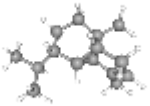
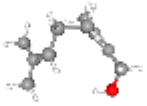
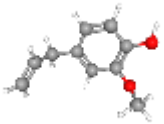
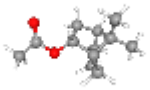
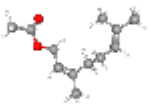
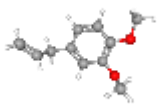
In a study, the polysaccharide content of myrtle fruit was analyzed. As a result, extractin consisted of 12.3% neutral sugars (5% arabinose, 3% galactose, 2.2% glucose, 1.6% rhamnose, 0.3% mannose, 0.1% xylose) and 28.8% uronic acids (14.4% galacturonic acid and 14.4% glucuronic acid). acid) was found. The high level of free glucose (65-70%) of the extract is remarkable(Chidouh et al., 2014). Essential oils from different populations of M. communis were analyzed. The main components of the oil are α-pinene (24.42-31.57%), limonene (up to 23.55% trace), 1,8-cineol (5.92-21.21%) and linalool (8.72-11.56%) (Bajalan and Ghasemi Pirbalouti, 2014).

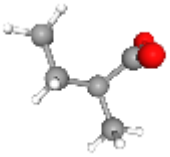
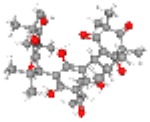
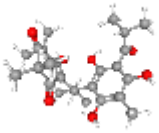
In another study, myrtle leaf extracts were found to be rich in galloyl-glucosides, galloyl-quinic acids, ellagitannins and flavonoids. In these extracts, galloyl-glucosides and galloyl-quinic derivatives were determined as the main components relative to ellagic derivatives(Romani et al., 2012). In addition, the nitrate content of the population grown in Turkey (238.85 mg/kg) was found to be quite high.(Özcan and Akbulut, 2008).

Table 2: Compounds of myrtle.

Compound	3D Conformer
Cis-β-ocimene	
β-Myrcene	
1,8-cineole	
γ-terpinene	
α-terpinolene	

p-Cymene	
Limonene	
α-phellandrene	
α-pinene	
β-Pinene	
Camphene	
Sabinene	
α-Thujene	
Myrtenal	

myrtenyl acetate	
α-Humulene/ α-caryophyllene	
α-guaiene	
α-copaene	
Nerol	
Eugenol	
bornyl acetate	
Neryl acetate	
methyl eugenol	

2-methyl butyrate	
Myrtucommulone A	
Semimyrtucommulone	

3. Ethnobotanical uses of Myrtle

Different parts of Myrtus communis L. are used as anti-inflammatory, anti-ulcer, sugar-lowering, diuretic, to treat respiratory and digestive system diseases(Jabri et al., 2018).

In ancient times, the myrtle was considered a symbol of immortality. Maybe because of this belief, it is used in cemetery visits in some regions(Ogur, 2014). Assyrians and Egyptians used myrtle leaf tea as an analgesic for joint pain (Lévesque and Lafont, 2000). In ancient literature, myrtle was widely used to control bleeding throughout the body(Ebrahimi et al., 2020). In Iranian Traditional Medicine, M. communis is a famous herb in the treatment of mouth ulcers and "Gholaa", the old name for canker sores(Mahboubi, 2016). In Iranian traditional medicine, Myrtus communis L was used as an insect repellent and insecticide(Cheraghi Niroumand et al., 2016).

On the other hand, Myrtle berry has been used to treat diarrhea, hemorrhoids, and gastrointestinal damage due to its astringent, tonic, and antiseptic properties(Jabri et al., 2016).

4. Pharmacological Activity of the Myrtle

4.1. Antioxidation Capacity

The antioxidant activity of myricetin-3-o-galactoside and myricetin-3-o-rhamnoside isolated from the leaves of Myrtus communis is very high(Hayder et al., 2008). Flavonoids and anthocyanins in berry extracts from traditional Sardinian myrtle liqueur were measured. Anthocyanins were found to be the most unstable compounds. Antioxidant activity was maintained at 3 months(Montoro et al., 2006). In a study, the main compound that increases the antioxidant capacity was found to be myricetin-O-glycosides(Pereira et al., 2016). In a study, antioxidant activities of prickly pear jam and cream, myrtle jam, orange and tangerine-orange marmalades were evaluated. As a result, the extract of myrtle fruits prevents the decrease of polyunsaturated fatty acids and the increase of malondialdehyde by preserved liposomes protected from Cu2+-induced oxidation(Rosa et al., 2015). It shows that myrtle plant protects liver tissues against oxidative damage following duct ligation even through its radical scavenging and antioxidant activities (Sen et al., 2016).

4.2. Antimicrobial Effect

Myrtus communis L. is a source of new compounds that can be used primarily as antimicrobial agents, both in the food industry and for medicinal purposes Acinetobacter baumannii is a rapidly emerging, increasing prevalence, highly resistant clinical pathogen. In a study, Myrtus communis L. essential oil was applied against A. baumannii wound isolates, both alone and in combination with traditional antibiotics. As a result, it was observed that the antibacterial effect of myrtle oil was strong when applied alone (Aleksic and Knezevic, 2014)(Ebrahimabadi et al., 2016). In a study aiming to measure antimicrobial activity against S. typhimurium, extracts of T. vulgaris, R.officinalis and M.communis were used. In this study where plant extracts were used separately and in combination, the group in which T. vulgularis and M.communis (0.55 - 0.45) were used together gave the best result (Fadil et al., 2018). In a study, the antimicrobial activity of the hydro-alcohol extract of Myrtus communis L. fruits was investigated against six strains of Listeria monocytogenes. As a result, myrtle strongly reduced or even inhibited the growth of strains(Serio et al., 2014).

One study examined the effects of dietary Myrtle on immune parameters in Oncorhynchus mykiss offspring. At the end of the trial, Alkaline phosphatase (ALP) activity was significantly increased in the most Myrtle-fed group compared to the control group. ($P < 0.05$). Also, no antibacterial activity was observed against

Escherichia coli, Staphylococcus aureus and Salmonella enterica, while myrtle showed antimicrobial activity against fish pathogens (Aeromonas hydrophila and Yersinia ruckeri)(Mansouri Taee et al., 2017).

Due to the antiviral, antimutagenic and proapoptotic activities of myrtle, a study was designed to investigate the effect of myrtle-based herbal suppository in cervicovaginal infections. Volunteers were prescribed 60 placebo or herbal vaginal suppositories (20 suppositories per menstrual cycle) for 3 months. At the end of the study, HPV testing was negative in 92.6% and 62.6% of the intervention and placebo groups, respectively(Nikakhtar et al., 2018).

One study evaluated the prebiotic potential of purple myrtle berries and white myrtle berries. According to the results, it was determined that myrtle fruits of both colors have prebiotic potential on L. casei. On the other hand, after freezing, the values of total phenolic compounds of the samples increased by 5.00 and 8.50 mg GAE 100 g-1, respectively (Öztürk et al., 2018).

4.3. Anti-Inflammatory Effect

Various pharmacological activities have been demonstrated, including myrtus anti-inflammatory, wound healing, antimicrobial, antifungal, analgesic, and anti-prostaglandin E2 (Khalilzadeh et al., 2019).

Myrtus communis L. has been used in traditional medicine for the treatment of inflammatory diseases. According to the results of a study using 350 mice, myrtle showed anti-inflammatory and antinociceptive effects(Hosseinzadeh et al., 2011).

4.4. Cancer and Myrtle

Studies have proven the cytotoxic effect of M. communis plant. This cytotoxic activity may be related to the antioxidant properties of the extracts. Antioxidant and antiproliferative activities show significant differences between plant genotypes(Yangui et al., 2021). Also, in another study which is about hydatid disease M. communis is potent against echinococcosis protoscolex as a scolicidals (Amiri et al., 2019). In a study, the bioprotective properties of Myrtus communis L. essential oil were evaluated. Myrtle essential oil was cytotoxic to colon cancer HT-29 and liver cancer HepG2 cells. In addition, myrtus essential oils inhibited the clonogenic growth of HepG2 cells(Myszka et al., 2020).

4.5. Diabetes and Myrtle

It is thought that Myrtle extract may improve cognitive and neuronal functions with its anticholinesterase and antihyperglycemic properties(Kadıoğlu Yaman et al., 2020).

In a study conducted in diabetic rabbits (with alloxan), the antihyperglycemic effect of the oral administration of myrtle oil and the 50 mg / kg dose of essential oil taken with the ingestion of the leaves were shown(Sepici et al., 2004). Myrtle oil shows its hypoglycemic activity with enhanced glycolysis, glycogenesis and reduced glycogenolysis. Further glucose load data suggest that Myrtle oil treatment produces hypoglycemia mainly by reducing intestinal absorption of glucose (Sepici-Dincel et al., 2007). The potential to transform M. communis into a functional food has been investigated. PTP1B and α-glucosidase inhibitors were detected in M. communis oil. therefore M. communis shows potential for T2D management(Liang et al., 2020).

4.6. Cardiovascular Health and Myrtle

Myrtus fruit extract is used for high utilization in thermal (140°C) preferred degradation and Cu2-mediated LDL assay applications. It also prevented undesirable fatty acids and their purchase (Tuberoso et al., 2010). In another study, intravenous administration of myertle methanol and ethyl acetate extract (12 mg/kg body weight) reduced mean arterial blood pressure with values of 20.6% and 32.49%, respectively(Bouaziz et al., 2015).

4.7. Epidermis Health and Myrtle

In a study, the possible protective role of oral or topical Myrtle (Myrtus communis L.) treatment against burn injury was investigated. Experimental burn model of Wistar Albino rats received 100 mg / kg / day myrtle extract orally or topically for 2 days. Severe thermal skin burn injury caused a significant decrease in glutathione level, superoxide dismutase, catalase and tissue factor activities, and nitric oxide level, accompanied by significant increases in skin malondialdehyde level. Inverted all biochemical markers except the histopathological changes caused by thermal trauma, as well as the nitric oxide level of the group receiving topical Myrtle treatment (Ozcan et al., 2019). All tissues undergo ischemia following thermal injury. In a study investigating the possible antioxidant effects of Myrtus communis ethanol extract on burn-induced oxidative distant organ injury orally, a burn model was created by exposing the dorsum of rats to a 90 °C water bath for 10 seconds under ether anesthesia. Then, 100 mg/kg/day of Mrytus communis ethanol extract was administered orally for two days. In conclusion, burn injury significantly increased MDA levels in lung and small intestine tissues and significantly decreased GSH levels, CAT and GST activities in small intestine and lung tissues. Mrytus communis ethanol extract decreased MDA level in both small intestine and lung tissues and significantly increased GSH level, SOD, CAT and GST activities(Ozcan et al., 2020).

Recurrent aphthous stomatitis is a common, painful and ulcerative disorder. The clinical efficacy of a new paste containing Myrtus communis (Myrtle) in the treatment of recurrent aphthous stomatitis was evaluated. Five parameters (size change, pain scale, erythema, exudation level, oral health effect profile, and patient's overall assessment of treatments) were recorded both before treatment and during each treatment episode. As a result, a statistically significant reduction in ulcer size, pain

severity, and level of erythema and exudation was reported(Babaee et al., 2010). A study aimed to investigate the effect of myrtle leaves on some molecular mechanisms involved in the wound healing process. Myrtus extract significantly reduced the expression of iNOS and COX-2 at the mRNA level in LPS-stimulated J774A.1 macrophage. Myrtus showed potent antioxidant activity at concentrations ≥ 15 μg/mL. Staphylococcus aureus and Bacillus subtilis were more sensitive to myrtusa than other spices(Raeiszadeh et al., 2018).

Propionibacterium acnes grow as biofilm. This aggregation is the cause of the in vivo resistance of P. acnes to antimicrobials. In a study investigating the anti-biofilm activity of Myrtacine® (Mediterranean myrtle extract), it has been shown that Myrtacine® is an effective aid during antibiotic treatment for acne vulgaris treatment (Feuillolay et al., 2016).

4.8. Urogenital System and Myrtus

According to the results of clinical studies, M. communis essential oil (lotion or ointment) significantly reduced bleeding, persistent pain, pain during defecation, anal irritation, anal itching and anal heaviness in patients with type I and II hemorrhoids(Mahboubi, 2017). In this study, the effect of Myrtus communis on hemorrhoid symptoms and quality of life was examined. The intervention group received Myrtus communis herbal ointment twice daily via the rectum for 4 weeks. As a result, the mean anal itching 4 and 8 weeks after the intervention was significantly lower in the Myrtus communis ointment group. Also, Myrtus communis herbal ointment has succeeded in reducing the symptoms of hemorrhoids(Malekuti et al., 2019).

In a study to evaluate the effect of myrtle syrup on abnormal uterine bleeding-menometrorrhagia, myrtle syrup was repeated for 3 consecutive menstrual cycles, 15 ml (5 ml 3 times daily) for 7 days from the onset of bleeding. As a result, mean bleeding days decreased from 10.6 ± 2.7 days to 8.2 ± 1.9 days after 3 months of treatment with syrup(Qaraaty et al., 2014). In vitro, Myrtus communis extract caused the death of T. vaginalis at pH 4.65(Mahdi et al., 2006).

Abnormal uterine bleeding is one of the common gynecological diseases that cause significant morbidity. In a study, Mrytus communis Linn exhibits anti-inflammatory activity. Therefore, Myrtus communis Linn shows promise in the treatment of abnormal uterine bleeding(Mobli et al., 2015).

Idiopathic heavy menstrual bleeding is a common gynecological problem without pelvic pathology or general bleeding disorder. In the studies, myrtle fruit syrup significantly reduced the duration of menstruation and blood loss(Javan et al., 2016).

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Conflicts of Interest

There are no conflicts of interest associated with this review.

Author Contributions

Sule Arslan and Gul Kızıltan conributed to conception and design the article. Sule Arslan and Gul Kızıltan reviewed the databases and selected the articles. Sule Arslan wrote the draft of the manuscript and Gul Kızıltan revised the submitted version of the manuscript.

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