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Myrtle (*Myrtus communis* L.) and potential health effects

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Abstract

Myrtus communis L., the common myrtle, is a plant which can be found in the Mediterranean and Middle East regions. The aim of the study is to evaluate the effects of myrtle on the human health. The fruit of myrtle has a unique flavour and can be in two different colours as black or white. Since ancient times, myrtle has been reported to be used in traditional medicine as a food and spice in the treatment of diarrhoea, peptic ulcer, bleeding, headache, palpitations, urethritis, conjunctivitis, pulmonary and skin diseases. In several studies, it has shown that different parts of the myrtle plant contain various bioactive compounds. The leaves of the plant contain quercetin, catechin and myricetin; its fruit contains phenolic compounds and anthocyanin. In the studies investigating the health effects of the myrtle plant, essential fatty acids obtained mostly from various parts of the plant, such as leaves, roots and fruits, were used. Essential fatty acids obtained from the plant are used in scientific and commercial fields such as cosmetics, medicine, food industry, aromatherapy and phytotherapy. It has been thought that positive effects on health due to the bioactive compounds contained in different parts of the myrtle plant. In previous studies, it has been found that the plant has antioxidant, antimicrobial, antidiabetic, anti-inflammatory, anti-ulcerative and antidiarrheal activities. However, it has been observed that most of these studies are animal studies and thus more human studies are needed.

Keywords

Antimicrobial, antioxidant, *Myrtus communis* L., myrtle.

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INTRODUCTION

Myrtus communis L., known as myrtle, is a flowering shrub that grows in the Mediterranean region and in the Middle East (Asgarpanah and Ariamanesh, 2015; Aleksic and Knezevic, 2014). The fruit of the myrtle is covered with a waxy layer, has a unique flavour and can be in two different colours, black or white (Soke and Elmaci, 2015). It has been reported that myrtle has been used in traditional medicine as treatment for diarrhea, peptic ulcer, bleeding, headache, palpitations, urethritis, conjunctivitis, pulmonary and skin diseases in the form of food or spice since the ancient times (Messaoud *et al.,* 2012; Akin *et al.,* 2010; Mahmoudvand *et al.,* 2015; Aksay, 2016). Essential oils obtained from various parts of plants have been used in scientific and commercial fields for many years including, cosmetics, medicine, food industry, aromatherapy and phytotherapy (Donmez and Salman, 2017). Essential oils and ingredients of plants have multiple biological activities (Hsouna *et al.,* 2014). The aim of the study is to evaluate the effects of myrtle plant and the essential oils obtained from the plant on the human health.

Nutritional composition of myrtle

Extracts obtained from various parts of the plant contain the same compounds in different amounts. The leaves of the myrtle contain quercetin, catechin and myricetin (Alipour *et al.,* 2014).

The fruit of myrtle contains various bioactive compounds, but mainly phenolic acids and anthocyanins (Asgarpanah and Ariamanesh, 2015; Sumbul *et al.,* 2011). The dark blue coloured fruit of the myrtle mainly contains polyphenolic compounds and shows high antioxidant activity while white coloured fruit of the myrtle predominantly contains unsaturated fatty acids such as myrtenyl acetate, linoleic acid and oleic acid (Messaoud *et al.,* 2011).

The energy, protein, fibre, fat, sugar, tannin, and essential oil content of the myrtle berries in Turkey were determined as 11.21 kcal/g, 4.17%, 17.41%, 2.37%, 8.64%, 76.11 mg/100 g, and 0.01%, respectively (Aydin and Ozcan, 2007). The berries of myrtle contain 74.1% of unsaturated fatty acids and 25.7% of saturated fatty acids, which are mainly 72.1% oleic acid and 15.7% palmitic acid. The fatty acid pattern is shown in Table 1.

Table 1: Fatty acid pattern of the fruit of myrtle.

Fatty Acids	Amount (%)
Caprylic acid	-
Capric acid	-
Lauric acid	4,3
Myristic acid	3,0
Pentadecanoic acid	0,5
Palmitoleic acid	0,3
Palmitic acid	15,7
Linolenic acid	<0,01
Linoleic acid	1,7
Oleic acid	72,1
Vaccinic acid	-
Stearic acid	2,2
Arachidonic acid	-
Eicosenoic acid	-
Arachidic acid	-
Saturated fatty acids	25,7
Unsaturated fatty acids	74,1

Myrtle contains various polyphenolic compounds. The essential oil obtained from the leaves contains α-pinene (31.8%), 1,8-cineol (24.6%), limonene (14.8%) and linalool (8.3%) (Ghasemi *et al.*, 2011). In its berries polyphenolic content have been found as ellagic acid (54.64%), gallic acid (12.70%), quercetin (3.72%) and quercetin 3-O-rhamnoside (3.71%) (Correddu *et al.*, 2019). It has been thought that the myrtle plant has positive effects on the health due to its phytochemical content (Sumbul *et al.*, 2011). Figure 1 shows the potential positive effects on health of myrtle and its products according to the information obtained from in vitro and in vivo studies.

Antioxidant activity of myrtle

The cell uses oxygen to generate energy, free radicals are formed as a result of the ATP production. These by-products are usually reactive oxygen and nitrogen species (Lobo *et al.*, 2010). The presence of these molecules in large amounts causes oxidative stress, which can cause many chronic diseases such as inflammation, diabetes and atherosclerosis (Percário *et al.*, 2020).

Anthocyanins are the C15 phenolic glycosides that give plants their colours. Anthocyanins have been found to have positive effects on oxidative stress related diseases (Skrovankova *et al.*, 2015). Studies have shown that essential oils obtained from the myrtle plant have high antioxidant activity (Dahmoune *et al.*, 2015). Delphinidin 3-O-glucoside (31.5%), petunidin 3-O-glucoside (25.8%), malvidin 3-O-glucoside represented (24.3%) and minor amounts of anthocyanins such as delphinidin-pentose (4%), delphinidin-pentose (3.8%), cyanidin 3-O-glucoside (6.3%), petunidin-pentose (0.7%), petunidin-pentose (1.6%), and peonidin 3-

O-glucoside (2%) were found in the Italian myrtle berries (Scorrano, 2017).

In the study conducted by Mimica-Dukić *et al.* (2010), it was reported that essential oil of the plant reduces the oxidant effect of DPPH, as well as the effects of t-BOOH mutagen. Xanthine oxidase activities of myricetin-3-o-galactoside and myricetin-3-o-rhamnocide isolated from myrtle leaves inhibit lipid peroxidation and oxidant effects of DPPH, while inhibiting the mutagenic activities of aflatoxin B1, nifuroxazide and H_2O_2. Methanol and ethyl acetate extracts obtained from myrtle plant inhibited the antioxidant effects as well as the genotoxic effects of aflatoxin B1 and nifuroxazide (Hayder *et al.*, 2008). Liquors of white and dark blue coloured myrtle were analysed in a study and it was found that white liquor has higher antioxidant capacity due to its high content of gallic acid and its derivatives (Serreli *et al.*, 2017).

Antimicrobial activity of myrtle

The consumption of contaminated foods with pathogenic bacteria is a major health problem (Cherrat *et al.*, 2014). *Salmonella*, *Clostridium perfringens*, *Campylobacter*, *Staphylococcus aureus*, *Clostridium botulinum*, *Listeria monocytogenes*, *Escherichia coli*, *Vibrio* are common foodborne bacteria that may the most pose health risk (European Food Safety Authority and European Centre for Disease Prevention and Control, 2018)

In a study investigating the antibacterial activity of essential oil obtained from myrtle leaves collected in Northern Cyprus consisted of eucalyptol (50.13%), linalool (12.65%), α-terpineol (9.05%) and limonene (4.26%). The results showed promising antibacterial effect on Staphylococcus aureus, *Listeria monocytogenes, Enterococcus durans, Salmonella, Escherichia coli, Pseudomonas aeruginosa* and *Bacillus subtilis* (Akin *et al.*, 2010). Yadegarinia *et al.* (2006) have found that the myrtle collected from Iran has mainly consisted of α-pinene (29.1%), limonene (21.5%), 1,8-cineol (17.9%) and linalol (10.4%). In addition, it has been determined that the myrtle plant with this content shows high antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus* and *Candida albicans* (Yadegarinia *et al.*, 2006). Similarly, in another study, it was found that the ethanolic extract obtained from the leaves of the myrtle has a strong antibacterial activity against *Escherichia coli*. Accordingly, the extracts obtained from the leaves of the myrtle plant could have a potential antibacterial effect on pathogenic bacteria (Douhri *et al.*, 2017).

In recent years, the increase in the frequency and variety of fungal infections has risen the importance of components with antifungal properties (Costa and Alexander, 2009). Essential oil of myrtle is known to cause damage to fungus cell

membranes, cellular material leakage and death of microorganisms (Yangui *et al.*, 2017). It has been reported that essential oil of myrtle have anti-fungal activity of on various pathogenic fungi such as *Rhizoctonia solani*, *Fusarium solani*, *Colletotrichum lindemuthianum*, *Sclerotiniaminor*, *Nigrospora oryzae*, *Cladosporium herbarea* and *Botrytis cinerea* (Kordali *et al.*, 2016).

Antidiabetic and anti-inflammatory activity of myrtle

Diabetes is a metabolic disease characterized by insulin secretion disorder or hyperglycaemia resulting from insulin insufficiency. Chronic hyperglycaemia that occurs with diabetes can cause dysfunction and failure of different organs, especially eyes, kidneys, nerves, heart and vessels (American Diabetes Association, 2014). The antidiabetic and antioxidant activity of the aqueous extract of the Myrtle was reported using diabetic rats. In the same study, serum glucose, aspartate aminotransferase (AST), alanine transaminase (ALT), and alkaline phosphatase (ALP) levels were significantly reduced in diabetic mice consuming 1000 mg/kg of myrtle aqueous extract for 14 days compared to the control group. When compared with the control group, it was determined that aqueous myrtle extract showed significant antioxidant activity in diabetic rats due to its superoxide dismutase activity, increased glutathione levels and decreased malondialdehyde levels (Demir *et al.*, 2016). In a study conducted on mice, it has been reported that myrtle has a potential anti-inflammatory effect in diseases related with inflammation and reduces oedema (Touaibia, 2017).

Antiulcerative and antidiarrheal activity of myrtle

The gastrointestinal system (GIS) is about 10 meters long and is a large system that starts from the mouth, runs through the chest, abdominal and pelvic spaces and ends in the anus. The main task of GIS is to convert nutrients in the diet into forms used by cells in the body for certain tasks (McErlean, 2016). Ulcers that can be found anywhere on the GIS mucosa are a cutaneous bare wound or lesions of mucosal tissue that exhibit gradual tissue breakdown (Kahn and Hall, 2014). It was found that the powder of the Myrtle berries has a significant effect on the healing of oral wounds in an animal study (Hashemipour *et al.*, 2017).

Diarrhea is usually characterized by negative effects on the intestines caused by a bacterial or viral infection, drug reaction, food allergy, or systemic disease (World Health Organization, 2020) Sisay *et al.*, (2017) has found 80% methanol extract from myrtle leaves had an antidiarrheal effect in mice.

Gastroesophageal reflux disease is one of the common chronic gastrointestinal diseases that can cause symptoms such as epigastric pain, indigestion, dysphagia, chronic cough and chest pain (Fock and Poh, 2010). The disease that characterized by spasm or impaired lower oesophageal relaxation, results in impaired flow of food into the stomach and subsequent displacement of stomach contents towards the oesophagus (Boeckxstaens *et al.*, 2011). In a double-blind randomized controlled study, it was reported that myrtle syrup reduced disease-induced symptoms in individuals with gastroesophageal reflux (Salehi *et al.*, 2017).

CONCLUSION

In conclusion, the extracts obtained from myrtle plant has antioxidant, antiulcerative, antimicrobial, antidiabetic and anti-inflammatory effects due to the phytochemical content. Thus, consumption of myrtle has potential positive effects on health. Since the researchers have found results at the cellular level or on animals, its effects on the human body are not fully known. Therefore, experimental human studies are needed to be thoroughly done.

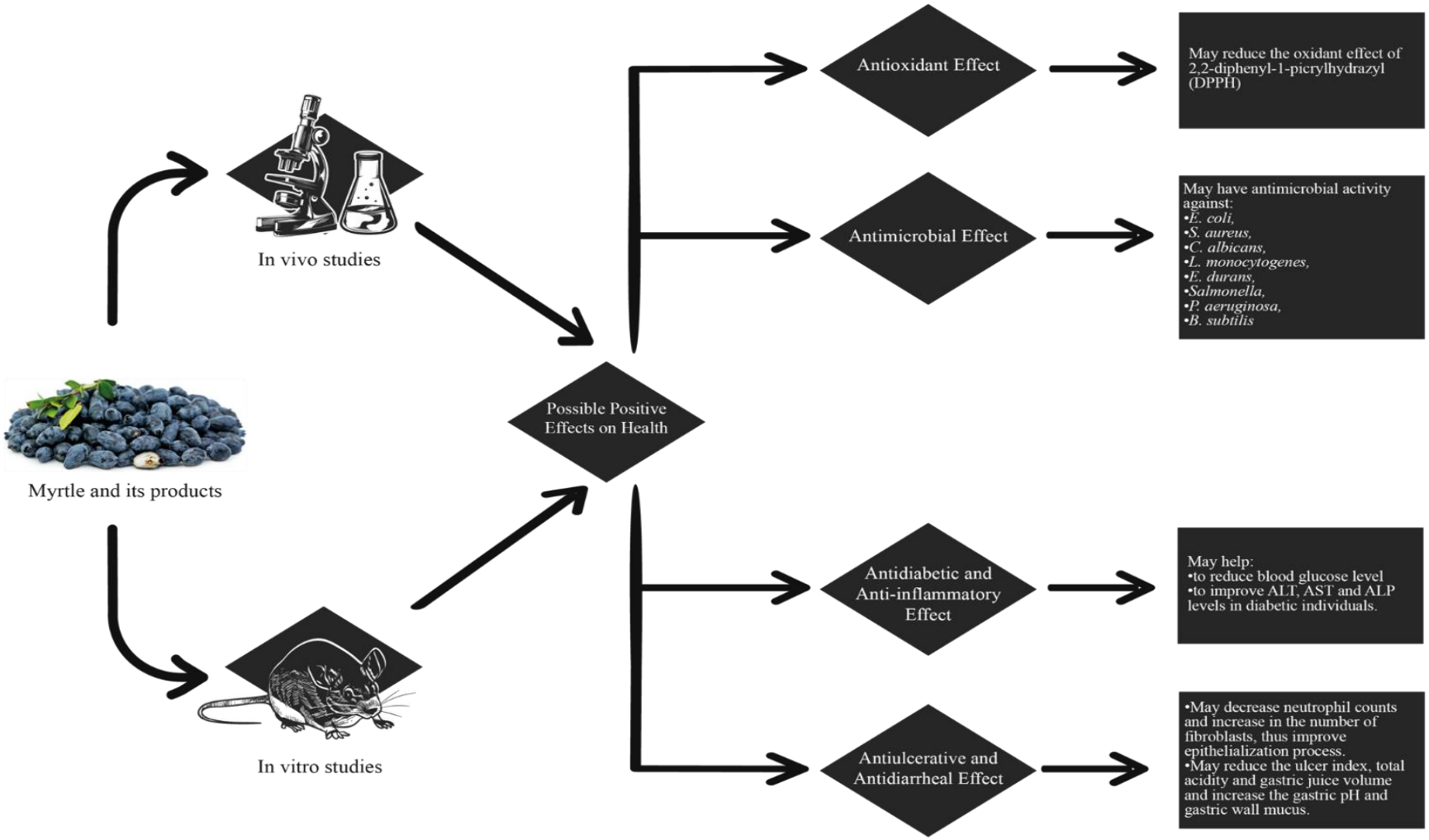

Figure 1: The potential positive effects on health of myrtle and its products according to the information obtained from in vitro and in vivo studies.

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