International Journal of Applied Home Science
(An International Double Blind Peer Reviewed / Refereed Research Journal of Home Science)
Volume 11 (9 & 10), September & October (2024) : 591-605
Received : 26.08.2024; Revised : 11.09.2024; Accepted : 26.09.2024

REVIEW PAPER
ISSN : 2394-1413 (Print)
DOI: 10.36537/IJAHS/11.9&10/591-605

A Review of Citrus and Other Botanicals for Potential Health Benefits

TANVI BABAN PAWAR*[1] AND VIJAY D. KELE[2]
[1]M.Sc. Student and [2]Associate Professor
[1]Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara (Gujarat) India
[2]Department of Dairy and Food Technology, Parul Institute of Technology, Parul University, Vadodara (Gujarat) India

ABSTRACT

In recent years, herbal teas have garnered significant attention for their potential health benefits and therapeutic properties. Among these, teas derived from citrus plants have emerged as particularly promising due to their distinct flavours and purported health-promoting effects. This review examines the scientific literature surrounding the use of *Citrus reticulata* (mandarin orange) leaves, *Citrus aurantifolia* (lime) leaves, *Citrus sinensis* (sweet orange), sage leaves, and peppermint leaves, with a specific focus on their potential implications for health. Additionally, this review provides a comparative perspective on *Citrus maxima* leaves, a lesser-explored member of the citrus family. *Citrus maxima*, also known as pomelo, offers leaves that have received relatively less attention despite their potential for health promotion and disease prevention. By consolidating existing knowledge on citrus leaves teas and highlighting research gaps related to *Citrus maxima* leaves, this review aims to provide insights into their therapeutic properties and stimulate further investigation into their health implications.

Keywords: Herbal tea, *Citrus reticulata* leaves, *Citrus aurantifolia* leaves, *Citrus sinensis* leaves, *Citrus maxima* leaves, Sage leaves, Peppermint leaves, Health benefits, Therapeutic properties

INTRODUCTION

Herbal teas have gained popularity in recent years because of their supposed medicinal and health advantages. Of the many varieties of herbal teas available, those made from citrus trees have drawn a lot of interest due to their unique tastes and potential health benefits. The scientific literature on the use of *Citrus reticulata* (mandarin orange), *Citrus aurantifolia* (lime), *Citrus sinensis* (sweet orange), sage leaves, and peppermint leaves is examined in this review. Particular attention is paid to any potential health effects, with a particular focus on *Citrus maxima* leaves.

Citrus trees are known for their juicy, vitamin C-rich fruits, but they also produce leaves that are used in herbal teas and traditional medicine. Mandarin orange leaves, or *Citrus reticulata* leaves, have been utilized traditionally in many cultures for their possible health advantages, which include antioxidant (Boudries *et al.,* 2017; Nasri *et al.*, 2018) and anti-inflammatory activity (Nasri *et al.*, 2018). *Citrus aurantifolia* leaves, which come from the lime tree, are also prized for their fragrant qualities and their medical applications, which include antidiabetic (Ibrahim *et al.*, 2019) and antimicrobial (Al-Aamri *et al.*, 2018; Lemes *et al.,* 2018). Another citrus plant that has both tasty fruits and leaves that may be good for your health is Citrus sinensis, also known as sweet orange. These leaves are of interest to both academics and herbal tea aficionados because of studies done on their antioxidant content (Adeolu *et al.*, 2020), antibacterial activity (Adamu *et al.*, 2022; Ekpiken *et al.*, 2021; Ekwenye and Edeha, 2010), and anti-inflammatory (Kumar and Mishra, 2020).

Beyond the citrus realm, popular herbal infusions with different flavours and possible health advantages include peppermint and sage teas. While peppermint

How to cite this Article: Pawar, Tanvi Baban and Kele, Vijay D. (2024). A Review of Citrus and Other Botanicals for Potential Health Benefits. *Internat. J. Appl. Home Sci.,* **11** (9 & 10) : 591-605

(Mentha x piperita) is valued for its cooling flavour and antioxidant advantages (Farnad *et al.*, 2014), sage (*Salvia officinalis*) has a long history of traditional usage for its anticancer (Patenkovic *et al.,* 2009; Pedro *et al.,* 2016) and antioxidant qualities (Ilyasoglu and Zemzemoglu, 2022; (Matsingou *et al.,* 2003).

The health benefits of each of these herbal teas have been extensively studied, but there is still a dearth of information on *Citrus maxima* leaves, the subject of this review. Large citrus fruits like *Citrus maxima*, or pomelo, are endemic to Southeast Asia. Despite being used less frequently than other citrus kinds, its leaves may have unrealized potential for promoting health and preventing disease. As a result, the purpose of this review is to compile the body of knowledge now available on citrus leaves and offer insights into the possible advantages and future lines of study for *Citrus maxima* leaves.

In summary, the exploration of herbal teas from citrus and other botanicals offers a rich tapestry of flavours and potential health benefits. By delving into the existing literature on *Citrus reticulata, Citrus aurantifolia, Citrus sinensis*, sage, and peppermint leaves, this review seeks to shed light on their therapeutic properties and pave the way for further investigation into the health implications of *Citrus maxima* leaves.

Citrus maxima leaves :

Citrus maxima leaves have long been used for their therapeutic qualities in a variety of civilizations. Numerous bioactive substances found in these leaves, including as flavonoids, phenolic acids, and essential oils, enhance their potential as medicinal herbs. But despite a lengthy history of traditional use, there hasn't been much scientific study done on the health benefits of *Citrus maxima* leaves.

In this review, we aim to explore the scientific literature surrounding *Citrus maxima* leaves, shedding light on their potential health benefits and therapeutic applications. By examining existing studies and research findings, we seek to provide a comprehensive overview of the phytochemical composition and pharmacological properties of *Citrus maxima* leaves.

Numerous volatile substances, such as monoterpenes, sesquiterpenes, and other fragrant components, are present in the essential oils that are extracted from *Citrus maxima* leaves. Key components that are frequently present in these essential oils include myrcene, limonene, linalool, citronellal, α- and β-pinene, sabinene, terpinene-4-ol, and citronellol (Rowshan and Najafian, 2013).

Although there is still much to learn about the pharmacological use of *Citrus maxima* leaves, early research points to a number of possible health advantages. Citrus maxima leaves have a variety of pharmacological applications, including as hepatoprotective (Fahmy *et al.*, 2022), anticancer (Kim *et al.,* 2010; Kundu Sen, *et al.,* 2011b; (Moon *et al.,* 2009), anti-inflammatory (Yang *et al.,* 2009), antimicrobial (Das *et al.*, 2013; Ezeabara and Dikeh, 2019; Jabamalairaj *et al.*, 2015; Prusty and Patro, 2014), antidiabetic (Kundu Sen *et al.,* 2011a), anti-obesity (Dinesh and Hegde, 2016), antiulcer (Sapkota and Jain, 2021), antidepressant (Potdar and Kibile, 2011; Sheik *et al.,* 2014) and antioxidant (Islam *et al.*, 2021) properties.

Review of Literature:

Citrus reticulata (Mandarin) leaves:

Lota *et al.* (2000) concluded that, fruits and leaves harvested from mandarin trees subjected to the same pedoclimatic and cultural conditions were used to extract the peel and leaf oils of 41 cultivars of mandarins, which are members of the *Citrus reticulata* Blanco species. Capillary GC, GC/MS, and 13C NMR were used to examine their chemical composition. The results were then subjected to a cluster analysis and a discriminant analysis. For peel oils, two significant chemotypes were identified: limonene and limonene/c-terpinene. For leaf oils, three major chemotypes were identified: sabinene/ linalool, linalool/c-terpinene, and methyl N-methylanthranilate.

Kasali *et al.* (2010) stated that, GC and GC/MS were used to analyze the chemical composition of hydrodistilled oils extracted from the leaves of six Nigerian-grown *Citrus reticulata* Blanco (mandarin) cultivars. The results of this study were then subjected to cluster analysis. Fifty-seven components, or 88.2–96.7% of the total oils, were identified. There was significant variation in the levels of sabinene, γ-terpinene, p-cymene, δ-3-carene, and (E)-β-ocimene found in every oil. Linalool, myrcene, terpinen-4-ol, and cis sabinenehydrate are some of the other ingredients. Furthermore, significant amounts of limonene, terpinolene, β-pinene, and α-pinene were found. One- and two-dimensional NMR methods were used to characterize the isotopes of β- and α-sinensal, which were separated using preparative GC.

Ye *et al.* (2022) opinioned that, in addition to the nine known acridone alkaloids (2–10) and fifteen flavone compounds (11–25), a novel acridone alkaloid, reticarcidone A (1), was also isolated from the leaves of *Citrus reticulata* Blanco. It is adorned with an oxygenated isopentenyl group between C-1 and C-2. Comprehensive 1D and 2D NMR and MS data analysis verified the compounds' structures. The first pyrano [2,3-a] acridone to be isolated from the Citrus genus was Reticarcidone A (1). When tested against the five human tumor cell lines MCF-7, SMMC-7721, HL-60, A549, and SW480, a few of these compounds exhibited moderate cytotoxicity.

Correa *et al.* (2016) explained that, based on NMR 1D and 2D, MS, and other analytical techniques, the chemical that causes the pungency in the essential oils of *Citrus reticulata* (mandarin) leaves was isolated, and its structure was identified as methyl-N-methylanthranilate. This material is analogous to a different class of molecules with antinociceptive properties. Compounds called terpenes are present in essential oils. When the substance that gives mandarin and other citrus leaves their pungency was isolated, it was unexpected to discover that it was methyl-N-methylanthranilate. These kinds of compounds with this sort of action may be exploited to find novel analgesics for use in human pain management.

Nasri *et al.* (2018) reviewed that, the pharmacological characteristics of *Citrus reticulata* Blanco leaf extracts (ECR) were assessed in this investigation. Significant antioxidant activity was displayed by ECR, which also proved safe at levels under 2,000 mg/kg in mice and had analgesic effects in tests using acetic acid and formalin. *In vivo*, ECR showed anti-inflammatory activity by reducing xylene-induced ear edema. ECR downregulated inflammatory genes and prevented oxidative and nitrosative damage in cell models. *Citrus reticulata* leaf extracts have been shown to have anti-inflammatory, analgesic, and antioxidant properties both *in vitro* and *in vivo*.

Fahmy *et al.* (2022) reported that, to distinguish between the essential oil compositions of six *Citrus reticulata* cultivars, this study used GC-MS and chemometric analysis. The identification of thirty-nine chemicals revealed that their main constituents were β-pinene, D limonene, γ-terpinene, linalool, and dimethyl anthranilate. The cultivars were effectively classified using principal component analysis and hierarchical cluster analysis. The most potent compounds against hyaluronidase, collagenase, and amylase, respectively, were found to be Kishu mandarin, Cara mandarin, and Wm (Wekiwa Murcott), according to *in vitro* tests. Molecular docking supported these results and offered possible explanations. There is potential for antiaging skincare products made from certain *Citrus reticulata* cultivars.

Boudries *et al.* (2017) stated that, this investigation determined that limonene constituted the majority of the essential oils extracted from Algerian mandarin, clementine, and wilking (*Citrus reticulata* cultivar wilking) fruits (77-97%). Mandarin oil proved to be the most potent antibacterial among the oils, since it demonstrated robust action against a range of microbes. For sensitive bacteria, the minimal inhibitory concentration (MIC) was 5 µL/mL. As DPPH free radical scavengers, all oils showed antioxidant activity, but mandarin oil had the highest efficacy. These citrus essential oils may be used to safely enhance the shelf life of food items by acting as antioxidants and antimicrobials.

Nie *et al.* (2022) explained that, *Citrus reticulata* "Chachi" (CRC) leaves, which are abundant in flavonoids and may have pharmacological and nutritional uses, were the subject of this study. Common peaks in CRC leaves from various areas were found using UPLC chromatographic finger printing in conjunction with principal component analysis, hierarchical cluster analysis, and similarity analysis. Tangeretin and hesperidin were shown to be the primary flavonoids with antioxidant activity using grey relational analysis. The study develops a chromatographic analytical technique for CRC leaves, showcasing its potential for quality assurance and offering guidance for a benchmark.

***Citrus aurantiifolia* (lime) leaves:**

Chriscensia *et al.* (2020) stated as, the plant known as lime (*Citrus aurantifolia*) is a member of the Kingdom Plantae under the domain Eukaryota. It is classified as a member of the Phylum Spermatophyta, Subphylum Angiospermae, and Class Dicotyledonae. The leaves are arranged alternately and measure 4-8 x 2-5 cm. They have a crenulated edge, an elliptic to oblong-ovate form, and petioles with slender wings.

Cruz-Valenzuela *et al.* (2013) concluded that, the Rutaceae family of citric fruits, including lime (*Citrus aurantifolia*), is widely grown for its functional and organoleptic features. Its smooth, greenish-yellow surface and extremely acidic juice make it an essential ingredient in many cocktail recipes as well as Mexican, Indian, Vietnamese, and Thai cuisines. Apart from being a traditional cure for colds and an abundant supply of vitamin C to ward against scurvy, lime essential oil (EO) with its terpene content gives it a unique taste and smell. Because of its well-known antibacterial and antioxidant qualities, lime extract (EO) is used in the food industry as an antioxidant, flavor enhancer, and antimicrobial agent, improving the taste and safety of food items that have been treated.

Jain *et al.* (2020) opinioned that, among the other citrus species, *C. aurantifolia* leaf oil has the greatest content of monoterpenes. The main components of *C. aurantifolia* leaf oil are geranial (19.4%), limonene (16.4%), neral (11.4%), nerol (9.5%), geraniol (7.5%), and geranyl acetate (6.6%). The sesquiterpenes p-caryophyllene (5.7%), (Z)-nerolidol (2.0%), (Z)-p-farnesene (1.8%), and p-elemene (1.6%) are found in concentrations higher than 1%.

Enejoh *et al.* (2015) explained that, *C. aurantifolia* is indigenous to the Indo-Malayan area and is thought to have originated in Southeast Asia about 4000 BC. It was probably taken to the Near East and North Africa by Arabs, and from Palestine it was transported to Mediterranean Europe by Crusaders. It was brought by Spaniards to Mexico and the Caribbean, where it was seen as natural. Spain, the United States, Israel, Morocco, South Africa, Japan, India, Brazil, Turkey, and Cuba are among the major citrus-producing nations. Lime leaves are used in folk medicine to treat a variety of conditions, such as skin disorders, fever alleviation, eye cleanse, and stomachaches. For headaches, crushed leaves are applied to the forehead; for fever with jaundice, sore throat, and oral thrush, the infusion is administered.

Al-Aamri *et al.* (2018) reviewed that, in June and July of 2015, fresh *Citrus aurantifolia* L. leaves were gathered in Sur city, Oman. The essential oil was extracted by hydrodistillation, with D-limonene making up the majority of the oil (63.35%). Using the DPPH free radical scavenging assay, the oil showed considerable *in vitro* antioxidant activity (IC50 value = 21.57 mg/mL). Tests for antibacterial activity revealed modest activity against *Escherichia coli* and high action against *Staphylococcus aureus*. Thirty-three chemicals were found; two prominent components were geraniol (6.23%) and 3,7-dimethyl-2,6-octadien-1-ol (7.07%).

Lemes *et al.* (2018) reported that, the main culprits behind tooth decay, which is a major public health issue, are oral cavity bacteria, particularly *Streptococcus* and *Lactobacillus*. The essential oils from fruit peel (CP-EO) and leaves of *Citrus aurantifolia* (CL-EO) were the subject of this investigation. The principal components were limonene (77.5%), linalool (20.1%), citronellal (14.5%), and citronellol (14.2%). The antibacterial activity of CL-EO and CP-EO was shown against oral pathogens, with MIC values varying between 20 and 200 µg/mL. They were particularly effective against *Lactobacillus casei* (31.25 µg/mL) and *Streptococcus* mutans (MIC = 20 µg/mL), suggesting that they may be useful against cariogenic bacteria. It is necessary to do more research.

Ibrahim *et al.* (2019) concluded that, in rats with alloxan-induced hyperglycemia, *Citrus aurantifolia* leaf essential oil, produced by hydrodistillation, had strong antidiabetic activity. D-limonene made up the majority (57.84%). Following 14 days of intraperitoneal injection (100 mg/Kg b.wt.), the oil increased the concentration of hepatic glycogen while markedly lowering fasting and hepatic glucose levels. Additionally, it improved dyslipidemia by raising HDL cholesterol and decreasing triacylglycerol, LDL cholesterol, and total cholesterol. Despite having a somewhat weaker antihyperglycemic potential than the reference medication, metformin, the oil showed notable benefits on glucose regulation and the capacity to alleviate the dyslipidemic consequences associated with hyperglycemia in rats.

Musdja *et al.* (2017) stated that, a long history of using lime leaves (*Citrus aurantifolia* Swingle) in folk medicine to treat a variety of infectious disorders exists. In this work, the antibacterial activity and inhibitory mechanism of lime leaf essential oil were investigated. Using Gas Chromatography-Mass Spectroscopy analysis, the essential oil obtained from Balitro Bagor shown strong antibacterial activity, especially against *Bacillus subtilis* (MIC of 0.125% v/v). Experiments revealed larger quantities of cations (K^+ and Ca^{2+}) leaking as well as increased nucleic acid and protein leakage, all of which pointed to increased bacterial cell damage. Observations using a scanning electron microscope verified that greater oil dosages caused significant cell damage. Citronellal (5.41%), neral (8.94%), kariofilena (5.72%), geranial (10.39%), and limonene (10.2%) were the principal constituents of lime leaf essential oil.

Narang and Jiraungkoorskul (2016) opinioned that, the primary uses of *Citrus aurantifolia* (family: Rutaceae) are in everyday eating, several cultural cuisines, and juice manufacturing. Its antimicrobial, antitumor, antidiabetic, antifungal, antihypertensive, anti-inflammatory, anti-lipidemia, and antioxidant qualities make it popular. In addition, it can shield the liver, heart, and bones and guard against kidney problems. Alkaloids, carotenoids, coumarins, flavonoids, phenolic acids, and triterpenoids are some of its secondary metabolites. Apigenin, hesperetin, kaempferol, limonoids, quercetin, naringenin, nobiletin, and rutin are some of its other significant ingredients; they all contribute to its medicinal qualities. The papers from 1990 to the present were found using the scientific search sites. The full-text papers were chosen after the titles and abstracts were filtered. In order to serve as a reference for future research, the current evaluation of *C. aurantifolia's* phytochemical properties is current.

Nweke (2015) reported that, research was done on the effects of 10%, 20%, 30%, and 40% concentrations of cold water extract from *Citrus aurantifolia* (Christm.) swingle (lime) leaves on the in vitro growth and germination of Penicillium oxalicum currie Thom., Aspergillus niger Van Tiegh, and Botryodiplodia theobromae Pat. The medicinal plant's ground leaves were subjected to phytochemical analyses, which identified flavonoids, glycosides, tannins, and phlobatannins. At all dosage levels, the plant's leaf extract substantially ($P < 0.05$) inhibited the mycelial development and spore germination of every test pathogen. With increasing dosage, the extract's inhibitory effect on mycelia development and spore germination grew, resulting in a toxicity profile of 40% > 30% > 20% > 10%. Aspergillus flavus showed the least sensitivity to *C. aurantifolia* extract, whereas Penicillium oxalicum exhibited the highest sensitivity. These results suggest that *C. aurantifolia* has a promising potential for managing the test pathogens in plants.

Al Namani *et al.* (2018) opinioned that, Lime, or *Citrus aurantifolia* L., is a tiny citrus fruit of the Rutaceae family. The objective of this study was to evaluate the flavonoid and total phenolic content, as well as the antioxidant potential of Oman lime leaves, which have been traditionally utilized for a variety of reasons, such as weight reduction and skin care. After being gathered, leaves from the Nakhal and Nizwa districts were powdered, dried, and extracted using ethanol. The principal secondary metabolites were verified by chemical analysis. The amount of phenolic and flavonoid content varied (96.55–322.57 μg of GAE/mg and 41.38–64.2-6.4 μg of QE/mg, respectively). Concentration-dependent moderate antioxidant activity was shown by both extracts (11.79-56.89% and 10.11-51.91%), with Nakhal demonstrating a higher total antioxidant capacity. Lime leaves are proposed as a rich source of flavonoids, and more research is advised to explore possible uses in the pharmaceutical and food industries.

Shchérazade *et al.* (2021) explained that, the analgesic efficacy of *Citrus aurantifolia*, which is utilized in traditional medicine for inflammatory and analgesic reasons, was assessed in mice. There were no alkaloids found in the phytochemical examination, but flavonoids, tannins, polyphenols, coumarins, saponins, and polyterpene sterols were. Testing for acute toxicity revealed that the extract was non-toxic, in accordance with OECD recommendations. The estimated oral LD50 ranged from 2000 to 5000 mg/kg bw. Using acetic acid-induced pain as a model, the analgesic efficacy was evaluated, and dosages of 250 mg/kg bw and 500 mg/kg bw demonstrated substantial inhibition rates. The analgesic efficacy was best at 250 mg/kg bw, with an inhibition rate of 88.64%. At modest dosages, the extract has analgesic properties.

Oderinde *et al.* (2016) reviewed, given the difficulties in controlling medication resistance in malaria, this study investigated *Citrus aurantifolia* leaf extracts as possible inhibitors of Plasmodium falciparum schizont formation. Through phytochemical screening, several solvents were found to include tannins, saponins, alkaloids, and glycosides. Only ethanol and water extracts included anthraquinone glycosides, cyanogenic glycosides, and saponin glycosides. There were no flavonoids or cardiac glycosides found. Several solvents were shown to have inhibitory effects on schizont development; ethanol showed the greatest inhibition (8.1%-88.4%), followed by petroleum ether (7.6%-75.3%), hexane (10.9%-56.0%), chloroform (8.1%-72.7%), and water (10.1%-51.4%). The range of inhibition for chloroquine was 6.4%–41.0%. The study emphasizes the need for continued research while highlighting *Citrus aurantifolia's* potential as a source of anti-malarial chemicals.

Nazir *et al.* (2023) concluded that, the pharmacological properties of ethanol extracts from the leaves of *Citrus aurantifolia* (*C. aurantifolia*) and *Allium fistulosum* L (*A. fistulosum*) were investigated in this work. Phytochemical study revealed that *C. aurantifolia* contains flavonoids and polyphenols. After 30 and 45 days, the effects of these extracts at dosages of 200 mg/kg, 400 mg/kg, and 600 mg/kg body weight were evaluated on coagulation parameters (Prothrombin time, activated partial thromboplastin time, and thrombin time) in rabbits. At 400 mg/kg, *A. fistulosum* dramatically raised PT, aPTT, and TT. At 400 and 600 mg/kg, *Citrus aurantifolia* significantly raised TT, PT, and aPTT. All measures (TT, PT, aPTT, and Fg) were substantially elevated by warfarin at a dose of 0.54 mg/kg.

***Citrus sinensis* (Sweet Orange) leaves:**

Prabahar (2018) explained that, *Citrus sinensis*, the scientific name for orange trees, is a member of the Rutaceae family in the kingdom of plants. It is also a member of the Magnoliophyta division, Dicotyledons class, Sapindales subclass, Rosidae order, and Aurantoideae subfamily. The *Citrus sinensis* leaves powder sample was subjected to an organoleptic characteristics examination, which indicated that it had a coarse fiber powder texture, a yellowish-green ash color, and a distinct pungent taste that is sour, coupled with an aromatic distinctive odor.

Sohi and Shri (2018) stated the, macroscopic characteristics of the plant include vivid, dark green upper leaves and light green bottom foliage, along with a distinct, pleasingly sweet scent. They are elliptical in shape with crenate borders, 8 to 13 cm long and 2 to 5 cm wide, and have a bitter and astringent flavour. With a slightly winged petiole, the base is obtuse and symmetric, and the apex is sharp. There are axillary spines and oil spots on a glabrous leaf surface. The leaves are leathery in texture and have a pinnate reticulate venation, making them simple leaves. The leaves have microscopic characteristics such as an upper epidermis with three to four layers of polygonal cells encased in a thick cuticle; the cells in *C. sinensis* are bigger than those in *C. paradisi*. Both forms include prismatic Ca-oxalate crystals. The palisade parenchyma of the mesophyll displays secretory cavities and crystals of calcium oxalate, which are typical features of dicot leaves. A sizable mid-rib bundle with crescentic structures may be seen in the vascular system, and *C. paradisi* has a hypostomatic lower epidermis with shrunken paracytic stomata. *C. paradisi* is the only species with secretory cavities next to the lower epidermis and a sclerenchymatous sheath protecting the lower bundle.

Prabahar *et al.* (2022) opinioned the following percentages were found when the plant sample's extractive values were determined: The amount of foreign matter was found to be 0.46%w/w, the amount of drying loss was 4.20%w/w, the amount of volatile oil content was 1.00%w/w, the total amount of ash was measured at 10.30%w/w, the amount of acid insoluble ash was found to be 1.00%w/w, the amount of ethanol-soluble extractive was 22.38%w/w, and the amount of water-soluble extractive was 29.14%w/w.

Siddique *et al.* (2012) reported that, GC-MS was used to examine the essential oil of *Citrus sinensis* var. mosammi. Seven of the eighteen components were recognized based on their fragmentation pattern. 13-phyllendrene (27.544%) was the most abundant component among the elements detected. It was followed by 3-carene (7.630%), limonene (4.873%), 13-pinene (3.278%), caryophyllene (3.154%), diethyltoluamide (2.339%), and a-pinene (1.298%).

Adamu *et al.* (2022) reviewed that, using the percolation technique, *Citrus sinensis* leaves were extracted progressively with water and methanol. Alkaloids, tannins, sterols, terpenoids, and flavonoids were found in the extracts by phytochemical screening. *Salmonella typhi* and *Salmonella paratyphi* exhibited restricted activity with 5 mm zone widths in in vitro antibacterial tests. It was not possible to calculate the minimum bacteriocidal concentration (MBC) or minimum inhibitory concentration (MIC). Compounds were identified by GC-MS analysis by matching with the NIST library.

Ekpiken *et al.* (2021) stated that, the study looked at the phytochemical components and antibacterial properties of extracts from Senna alata and *Citrus sinensis* leaves against three medically important bacteria found in fish ponds in Calabar: *Pseudomonas aeruginosa, Escherichia coli,* and *Staphylococcus aureus*. The antibacterial activity of both extracts was significant, while *C. sinensis's* potency was greater. Alkaloids, saponins, tannins, glycosides, polyphenols, steroids, reducing agents, and flavonoids were identified by phytochemical examination of *C. sinensis*. Alkaloids, tannins, glycosides, polyphenols, phlobatanins, steroids, reducing agents, and flavonoids were all present in the *S. alata* extract. The findings are consistent with these plants' potential for therapeutic use.

Ekwenye and Edeha (2010) reviewed that, *Citrus sinensis* was tested for its antibacterial properties against strains of bacteria including *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Klebsiella pneumoniae*. For the extraction, ethanol and water were utilized. The agar disc diffusion technique was used to measure the antibacterial activity in vitro. The aqueous extract's antibacterial activity demonstrated a seven millimeter-diameter zone of inhibition on *Escherichia coli*, but no or very little zone of inhibition, measuring between 0 and 3 mm, was seen on the other pathogens. On the test organisms, the ethanol extract also revealed tiny zones of inhibition with a width of 1-3 mm. There were no zones of inhibition in the minimum inhibitory concentration (MIC) that was determined using a two-fold serial dilution on the ethanol and aqueous extracts. The study's findings indicated that there is little chance of using the extracts to treat illnesses brought on by the test organisms.

Mohammed *et al.* (2021) concluded that, the study used ethanol, ethyl acetate, petroleum ether, and water to examine the antibacterial and antifungal properties of *Citrus sinensis* leaf extracts. *Salmonella typhi* and *Escherichia coli* were significantly inhibited by ethanol and ethyl acetate extracts. Outstanding antifungal efficacy against *Aspergillus fumigatus* and *Aspergillus niger* was demonstrated using ethanol extract. The findings validate the traditional medical use of extracts from *Citrus sinensis* leaves and recommend more research for a more thorough examination.

Kumar and Mishra (2020) stated that, *Citrus sinensis*, which has been used traditionally to treat a variety of illnesses, exhibits strong antinociceptive and anti-inflammatory properties that are on par with those of phenylbutazone. In carrageenin-induced edema (30.2–63.2% protection), cotton pellet granuloma (47.2–45.4% protection), and analgesio meter force-induced pain (98.1–146.5% protection), the leaf extract, especially at 200 mg/kg bw, shows dose-dependent suppression. Moreover, it guards against writhing brought on by acetic acid (7.19–37.8%). Alkaloids, cardiac glycosides, flavonoids, phenols, saponins, steroids, and terpenoids are all included in phytochemical analysis. These results validate its promise as an affordable, low-side-effect, and alternative therapeutic agent.

Adeolu *et al.* (2020) reported that, phytochemicals and antioxidants were examined in methanol extracts from *Citrus sinensis* leaves (CS) and their epiphytes (CSE). Bioactive substances such as eriocitrin, quercetogenin, tangeretin, and hesperidin were detected by HPLC; eriocitrin was shown to be more prevalent in CSE and tangeretin in CS. Lipid peroxidation, FRAP, DPPH, and nitric oxide radicals were among the antioxidant tests that demonstrated CS's greater antioxidant capability than that of CSE. These results imply that CS has a higher concentration of phytochemicals, displaying strong bioactive substances with notable antioxidant potential. The extracts could be useful in treating pathological ailments.

Mannucci *et al.* (2018) explained, preclinical and clinical research on the anxiolytic properties of essential oils (EOs) derived from *Citrus aurantium* or *Citrus sinensis* is reviewed in this review. Both EOs have been shown to have anxiolytic effects in preclinical trials and a range of clinical situations, according to nine clinical research. In some situations, aromatherapy using *Citrus aurantium* EO relieves anxiety, while *Citrus sinensis* EO is effective in lowering anxiety levels. The study emphasizes how crucial it is to do more thorough clinical research and use precise reporting procedures.

Oliveira *et al.* (2005) reviewed, the purpose of the study was to evaluate the contractile impact of *Citrus sinensis* leaf extracts, both acetone and crude, on the mammalian myocardium. In guinea pig atria, the extracts caused inotropic depression in spite of prior research showing promise for flavonoids. The greatest impact of the crude extract was 79.4%, while the EC50 values differed amongst extracts. The acetone extract changed cardiac phenomena, indicating participation of potassium channels and myocardial action potential length, whereas receptor blocking had no influence on the crude extract's effects. The study draws attention to surprising results and plausible processes that need more research.

Garcia *et al.* (2017) explained that, hexane (CH), ethyl acetate (CEA), dichloromethane/ethanol (CD/Et – 1:1), or ethanol/water (CEt/W – 7:3) were used to extract the dry leaves of *Citrus sinensis*. The extracts exhibited antileishmanial activity, while CD/Et showed significant changes in the ultrastructure of the treated parasites. According to cytotoxicity tests, CH and CD/Et have anti-amastigote assay effects akin to those of amphotericin B. Triterpene amyrins were present in the extracts, and CD/Et decreased the proportion of infected macrophages and the quantity of intracellular amastigotes. The findings shown here demonstrate that *C. sinensis* is a possible source of antileishmanial drugs.

Sage leaves :

Sharma *et al.* (2019) stated that, it's a important herb with both medicinal and aromatic purposes, sage (*Salvia officinalis* L.) is grown all over the world for the extraction of its essential oils. Packed with ingredients such as 1, 8-cineole, camphor, α-thujone, and rosmarinic acid, it has long been used to treat a variety of illnesses. Its chemical makeup, cultivation, therapeutic uses, and ethnobotanical relevance are all summed together in this review. Its anti-inflammatory, anti-diabetic, anti-microbial, anti-cancer, and hypolipidemic qualities are highlighted by pharmacological research. *In vitro* and animal research on memory and nerve problems also show that the plant has cognitive advantages. There includes a thorough discussion of the growing process, harvesting, and environmental factors.

Kamiloglu *et al.* (2012) opinioned that, Sage (*Salvia officinalis* L.) is a popular fragrant and therapeutic plant of Mediterranean origin. It belongs to the mint (Labiatae) family, which has approximately 900 species worldwide (Itani *et al.*, 2008). It is an evergreen shrub that may grow up to 80 cm in height. It features huge, eye-catching violet flowers, a woody stem with straight branches, opposing silver oval woolly leaves, and a long, spindle-shaped base. Sage grows from 100 to 800 meters above sea level and is found in dry, rocky limestone soils, riverbeds, and the borders of pine woods. Geographically, the plant may be found in Greece, Cyprus, Lebanon, Syria, Palestine, Crete, Turkey, and Sicily in addition to the southern regions of Italy. These days, sage is usually ingested in the form of herbal tea, which is made by infusing dried sage leaves with boiling water. Few clinical trials have been conducted to confirm the well-established traditional uses of sage, which include the symptomatic treatment of mild dyspeptic complaints, the treatment of inflammation of the mouth and throat mucous membranes, and the relief of excessive perspiration and minor skin inflammations.

Draz *et al.* (2021) explained, conversely, the moisture, ash, protein, lipids, and crude fiber contents of sage leaves were 8.19, 2.17, 12.21, 3.33, and 2.6%, respectively. Sage leaves have a polyphenol content of 0.262 and a flavonoid content of 0.13%, respectively. Nineteen of the twenty-one chemicals found in the aqueous extract of sage leaves were identified.

Grulová and Šalamon (2013) reported that, these teas' essential oil was extracted by hydro-distillation, and gas chromatography (GC) was used for analysis. The essential oil composition of the teas we tested varied greatly, particularly in terms of the percentage of the main oil constituents in the total oil content: 1,8 cineole (5-45%), α–thujone (2–35%), β–thujone (1–13%), camphor (16–42%), borneol (2–12%), terpineol (1–10%), sabinyllactone (<1–14%), and terpinylacetate (1–5%). Such a broad variance in the content of essential oils might indicate the existence of distinct garden sage chemotypes in addition to environmental factors or the addition of flower components to teas. Customers should be informed that various garden sage teas from different origins may differ in content, taste, and/or scent or antioxidant activity.

Doymaz and Karasu (2018) reviewed that, the purpose of the study was to evaluate how the air temperature (45–65 °C) affected the kinetics of sage leaf drying in a cabinet drier. Temperature affected the drying time, and eight models were used to examine how the moisture ratio changed over time. The model that showed the greatest R2, lowest χ2, and lowest RMSE values was found to be the most appropriate one: Midilli and Kucuk. Effective moisture diffusivity (Deff), which ranges from 1.62×10-9 to 5.73×10-9 m^2/s, was found by Fick's second law. Temperature had a major impact on Deff. The temperature dependency was modeled by the Arrhenius equation, which produced an Ea value of 52.52 kJ/mol. Total phenolic content (TPC) and antioxidant activity (AA) were affected by drying temperature, with 45 °C showing the greatest values. According to the study, drying sage leaves at lower temperatures will reduce color change and phenolic degradation.

Hamrouni-Sellami *et al.* (2013) opinioned that, this study evaluated the effects of seven drying techniques on *Salvia officinalis* L. in terms of antioxidant activity in methanol extracts, total phenolics, specific phenolics, and flavonoids. The total phenolic content obtained by microwave (MW) drying at 800 W/30 g was found to be 4.2 times higher than that of fresh plants, but far-infrared (FIR) drying at 45 °C produced the lowest amount. Fresh and MW (600 W/30 g) dried plants had phenolic acid preponderance, according to RP-HPLC analysis, however flavonoids were more abundant in FIR (65 °C) dried plants. Increased radical scavenging activity (RSA) against DPPH and higher activity in the â-carotene/linoleic acid system were seen in MW-dried plants at 800 W/30 g. The decreasing power of all the extracts was modest. The results imply that MW drying might help the sage plant materials retain its phenolic content and increase its antioxidant activity.

Matsingou *et al.* (2003) explained that, certain ingredients found in sage provide its aqueous infusions its antioxidant properties. Four organic solvent extracts from sage aqueous infusions were analyzed in an effort to learn more about the chemical makeup and characteristics of these constituents. Several components were separated from these extracts by HPLC analysis; four of these components were identified and quantified using reference compounds with established chromatographic HPLC profiles. These substances include the hydroxycinnamic acid caffeic acid and the diterpenes carnosic acid, carnosol, and rosmanol. The remaining aqueous fraction and the four organic solvent extracts were evaluated for their polyphenol content and antioxidant activity. The extracts' polyphenolic and non-polyphenolic components both play a major role in the derived extracts' shown antioxidant activity and, consequently, in the antioxidant activity of sage. This means that they represent the antioxidant capacity of sage's aqueous infusions against reactive oxygen species produced by a variety of iron-promoted oxidative processes.

Sá *et al.* (2009) stated that, common sage, or *Salvia officinalis*, is a herb that has anti-diabetic qualities. Six healthy female volunteers, ages 40 to 50, participated in a non-randomized crossover experiment as part of a pilot study to assess the potential benefits of sage tea drinking on blood glucose management, lipid profile, and transaminase activity in humans. The impact of sage consumption on the expression of Hsp70 in lymphocytes and the SOD and CAT activities of erythrocytes were also assessed. There was no change in plasma glucose after four weeks of sage tea administration. Lower plasma LDL and total cholesterol levels, together with increased plasma HDL cholesterol levels, were seen during and two weeks following therapy, indicating an improvement in the lipid profile. Furthermore, erythrocyte SOD and CAT activities as well as lymphocyte Hsp70 expression were elevated by sage tea. No side effects or hepatotoxic effects were observed.

Ilyasoglu and Zemzemoglu (2022) concluded that, using the response surface approach, the effects of infusion time and temperature on the sensory characteristics and antioxidant capacity of sage tea were assessed in this study. Over 90% of the response variability was explained by the quadratic models that were produced. While the total phenolic content and antioxidant capacity ($p<0.05$) on the responses were significantly positively impacted by the infusion temperature, the sensory characteristics were significantly negatively impacted by it. The ideal brewing parameters were found to be between 75 and 80 ºC for two to four minutes.

Patenkovic *et al.* (2009) reported that, using Drosophila melanogaster and the somatic mutation and recombination test (SMART), the study examined the antimutagenic properties of infused salvia officinalis (sage) tea. The antimutagenic activity of sage tea was evident in its reduction of methyl methanesulphonate (MMS)-induced mutations. Sage had an antimutagenic effect in both brief and prolonged treatments, as well as when combined with MMS. The findings imply that sage may lessen mutation events brought on by mutagens like MMS by suppressing metabolic activation and acting as an antioxidant.

Pedro *et al.* (2016) opinioned that, it has been discovered that *Salvia officinalis* and its constituents boost colon cell growth in vitro and guard against DNA damage. When given prior to azoxymethane injection, sage therapy had a chemopreventive impact on colorectal cancer by lowering the amount of aberrant crypt foci. In colonocytes and lymphocytes, the therapy also reduced the proliferation marker Ki67 and DNA damage, demonstrating the *in vivo* chemopreventive properties of S. officinalis. These results imply that sage therapy offers extra health advantages and supports sage ingestion by preventing the initial phases of colon carcinogenesis.

Lima *et al.* (2007) stated that, consuming sage tea surprisingly enhanced the amount of liver damage caused by carbon tetrachloride (CCl_4) in rats, even though it elevated antioxidant enzymes including glutathione peroxidase and GST. The investigation revealed increased expression of the CYP 2E1 protein, histological liver damage, and raised plasma transaminase levels, all of which might indicate a possible herb-drug interaction. Drinking sage tea potentiated the hepatotoxicity more in females than in males, indicating that concurrent use of medicines metabolized by phase I enzymes should be done with caution.

Walch *et al.* (2011) explained that, the polyphenolic content of commercially marketed sage teas varied significantly, with rosmarinic acid variations of up to 20 times. The antioxidant potential was highly reliant on rosmarinic acid and its derivatives, with values ranging from 0.4 to 1.8 mmol trolox equivalents/100 mL. These polyphenols and the Folin–Ciocalteu index showed a strong correlation, indicating the index's potential for sage tea quality screening. The varied antioxidant content and polyphenolic makeup of various teas draw attention to the necessity of quality standards, especially if these are meant for medicinal purposes. To determine the dose-benefit connection, more study is necessary, taking into account any possible negative effects of sage's ingredients such thujone.

Peppermint leaves:

Balakrishnan (2015) stated that, *Mentha piperita*, often known as peppermint, is a hybrid mint native to Europe and the Middle East that is now grown all over the world. Its concentrated oil contains a lot of menthol, menthone, and menthyl acetate. Dried peppermint contains volatile oils such as 1,8-cineol, menthol, menthone, menthyl acetate, and menthofuran. Additionally, pinene, limonene, pulegone, and caryophyllene are found in peppermint oil. Internal usage of peppermint oil has been used to treat respiratory conditions, gastrointestinal issues, irritable bowel syndrome, and oral discomfort. Its antispasmodic properties have led to its use historically. External application has been utilized to address myalgia and neuralgia. Peppermint oil has a cooling effect in addition to being a carminative, cholagogue, antibacterial, and secretolytic. Enteric-coated peppermint oil capsules have been used as an antispasmodic prophylactic prior to colonoscopies.

Mahendran and Rahman (2020) reported that, Peppermint (*Mentha × piperita* L.), a fragrant perennial plant in the Lamiaceae family, is grown across temperate areas worldwide. It has been used medicinally for fever, colds, digestive issues, and antiviral properties in addition to its traditional culinary uses. Scientific studies have demonstrated a multitude of biological effects, including antibacterial, anti-inflammatory, anticancer, and anti-diabetic qualities. The distinct aroma and therapeutic properties of peppermint are ascribed to its bioactive phytochemicals, encompassing flavonoids, phenolics, lignans, and essential oils. This brief document provides a summary of the various biological activity, phytochemical composition, and traditional medicinal uses of peppermint.

Mainasara *et al.* (2018) concluded that, Fresh peppermint has a higher moisture content (89.5%), a lower protein content (2.19%), a lower lipid content (0.50%), and a higher carbohydrate content (92.31%), per this study on *Mentha piperita*, or peppermint. Conversely, dried peppermint has less carbohydrates (56.31%) and more protein (7.69%), fat (5%), and fiber (9%). There was a difference in the mineral content; fresh peppermint had higher moisture content and more potassium (72%) than dry peppermint (22%). All things considered, this study provides valuable insights into the nutritional profile of peppermint and emphasizes the plant's potential as a source of antioxidants and nutrients.

Gadaka *et al.* (2021) explained that, peppermint tea is a well-liked herbal tea produced from the aromatic perennial shrub *Mentha piperita* L. The phytochemicals and elemental components of peppermint tea leaves were evaluated in a methanolic extract. Phytochemical screening identified alkaloids, flavonoids, glycosides, saponins, steroids, tannins, terpenoids, and total phenolic compounds. A review of the data showed the following hierarchy: Total phenolic compounds > flavonoids; terpenoids > alkaloids > glycosides > tannins > steroids > saponins. Elemental analysis revealed the following: Potassium (116.67 mg/kg), Calcium (96.67 mg/kg), Sodium (93.33 mg/kg), Iron (77.53 mg/kg), Copper (49.13 mg/kg), Manganese (15.33 mg/kg), Magnesium (9.33 mg/kg), and Zinc (0.80 mg/kg). This study emphasizes the significant bioactive components of peppermint, which contribute to its remarkable nutritional and medicinal potential (Gadaka *et al.*, 2021).

McKay and Blumberg (2006) explained that, Hesperidin, eriocitrin, luteolin, and rosmarinic acid are among the phenolic components in peppermint tea (*Mentha piperita* L.), which makes it popular. With a high concentration of menthone and menthol, the essential oil has demonstrated antiviral, antioxidant, anticancer, antibacterial, and antiallergenic properties in vitro. Research conducted on animals demonstrates the advantages of immunomodulation, chemoprevention, analgesic and anesthetic effects, and gastrointestinal tissue relaxation. Human studies have indicated that peppermint oil may be useful in treating the symptoms of irritable bowel syndrome (IBS), despite the paucity of information on peppermint tea or leaves. Peppermint oil should be used with caution by anybody with certain medical conditions, such as kidney stones, hiatal hernias, or GI reflux, even if there haven't been any documented adverse effects from peppermint tea.

Hayat (2020) reviewed that, this study looked at the effects on peppermint leaves of microwave and hot-air oven drying. The highest weight reduction of 87.1 per cent was attained by using a hot air oven set at 80°C for 180 minutes and a microwave set at 900W for 3 minutes. By microwave drying at 900W, the highest total polyphenol content (406.7 mg GAE/100 g FW) and total flavonoid content (247 mg CE/100 g FW) were attained. The ability of leaves to scavenge DPPH increased significantly (to 86.8%) when they were microwave-dried as opposed to 34% when they were dried in a hot air oven. The potential of microwave drying to provide better results in less time proved to be beneficial, suggesting that peppermint leaves' shelf life and usefulness may be increased.

Chi *et al.* (2016) stated that, this study set out to assess the effects of different hot air drying temperatures (40–80°C) on dried peppermint's essential oil content and color features. Testing for consumer preferences was conducted, and the Hunter L.a.b. technique was used to quantify color. The findings showed that at higher drying temperatures, the essential oil concentration reduced significantly. Mathematical models showed that hue angle, L, a, "E, and chroma followed the zero-order model, whereas chroma and b followed the first-order model. The study shows a relationship between colour attributes and visual sensory evaluations, which sheds light on the best drying conditions for peppermint.

Malekmohammad *et al.* (2021) reported that, in this study, the supposed inherent toxicity of peppermint (*Mentha x piperita* L.), a medicinal plant with remarkable pharmacological characteristics, was examined. The review classified the cytotoxicity, acute, subacute, and chronic impacts, as well as the developmental toxicity of peppermint and its main constituents. The data point to a moderate level of toxicity, particularly in relation to interactions with cytochrome P450 isoenzymes that might impact drug metabolism. When taken by people with bile duct obstruction, gall bladder inflammation, liver disorders, gastrointestinal reflux, or hiatus hernia, peppermint essential oil may exacerbate symptoms.

Farnad *et al.* (2014) explained that, Iranian peppermints were used to test the antioxidant potential of peppermint (*Mentha piperita*) extracts, including methanol, ethanol, and methanol/ethanol (1:1). The methanol extract had the highest phenol content and the greatest scavenging action of hydrogen peroxide and superoxide. The methanol/ethanol (1:1) extract exhibited the greatest DPPH radical scavenging and ferric reduction power. The ethanol extract had the highest nitric oxide radical scavenging effectiveness. It was found that rutin, caffeic acid, and chlorogenic acid were a few of the phenolic components. These findings highlight the potential of alcoholic peppermint extracts as a natural antioxidant, with potential applications in oxidative stress management, dietary supplements, and pharmaceuticals.

Salawu and Akinseye (2017) reported that, in this study, the effects of oral peppermint tea administration on the livers of Wistar rats were assessed. Rats were given different doses of peppermint tea over a period of four weeks. A biochemical and histological examination was conducted. The outcomes showed that the liver tissues stayed normal and similar to the control group. Other biochemical signs and liver biomarkers were within permissible limits. The results of the study indicate that peppermint tea is safe to consume and had no adverse effects on the livers of Wistar rats.

Conclusion:

In conclusion, review on the health benefits of *Citrus reticulata, Citrus aurantifolia, Citrus sinensis*, sage, and peppermint leaves has shown promise, but a new conversation about *Citrus maxima* leaves points to a possible paradigm change. The review underscores the significant pharmacological potential of *Citrus maxima* leaves, which remains largely unexplored in scientific research. Despite the extensive investigation into other citrus species and botanicals, *Citrus maxima* leaves have received limited attention in the literature.*Citrus maxima* leaf study must thus be given top priority in order to fully realize the advantages of these leaves and transform the field of herbal treatments and nutritional supplements.

REFERENCES

Adamu, U., Yushau, M., Salisu, B. and Hussain, A. M. (2022). Phytochemical screening, antibacterial potentials and gas chromatography-mass spectrometry analysis (GC-MS) of *Citrus sinensis* leaves extracts. *Microbes & Infectious Diseases*, **3**(1) : 192-198.

Adeolu, F.J., Oluwaseun, A.A., Olawale, J.T., Racheal, A.J., Adedoyin, O.B., Mary, A.A., ... and Tolulope, O.M. (2020). Comparative Antioxidant Potentials And High Performance Liquid Chromatography of Leaf Extracts of *Citrus Sinensis* and its Epiphytes.

Al Namani, J., Baqir, E., Al Abri, A., Al Hubaishi, T., Husain, A. and Khan, S.A. (2018). Phytochemical Screening, Phenolic Content and Antioxidant Activity of Citrus aurantifoliaL. Leaves Grown in Two Regions of Oman: Antioxidant activity and quantification of phenolics in Omani lime. *Iranian J. Pharmaceutical Sci.*, **14**(1) : 27-34.

Al-Aamri, M.S., Al-Abousi, N.M., Al-Jabri, S.S., Alam, T. and Khan, S.A. (2018). Chemical composition and in-vitro antioxidant and antimicrobial activity of the essential oil of Citrus aurantifoliaL. leaves grown in Eastern Oman. *J. Taibah University Medical Sci.*, **13**(2):108-112.

Balakrishnan, A. (2015). Therapeutic uses of peppermint-a review. *J. Pharmaceutical Sci. & Res.*, **7**(7):474.

Boudries, H., Loupassaki, S., Ettoumi, L.Y., Souagui, S., Bey, B.M., Nabet, N., ... and Chibane, M. (2017). Chemical profile, antimicrobial and antioxidant activities of *Citrus reticulata* and *Citrus clementina* (L.) essential oils. *Internat. Food Res. J.*, **24**(4) : 1782.

Chi, N.T.K., Thao, D.T.T. and Tuan, H.Q. (2016). Effect of hot drying on the essential oil content and colour charactiristics of Pepper Mint (*Mentha piperita*). *Vietnam J. Sci. & Technol.*, **54**(3) : 314-332.

Chriscensia, E., Wibowo, E.C., Enriko, G., Wijaya, O.C. and Sahamastuti, A.A.T. (2020). Phytochemical Screening, Therapeutic Benefits, and Adverse Effects of Citrus aurantifolia-A Review. *Indonesian J. Life Sci.*, 56-69.

Correa, E., Quiñones, W. and Echeverri, F. (2016). Methyl-N-methylanthranilate, a pungent compound from *Citrus reticulata* Blanco leaves. *Pharmaceutical Biology*, **54**(4) : 569-571.

Cruz-Valenzuela, M.R., Tapia-Rodriguez, M.R., Vazquez-Armenta, F.J., Silva-Espinoza, B.A. and Ayala-Zavala, J.F. (2016). Lime (*Citrus aurantifolia*) oils. In *Essential oils in food preservation, flavor and safety* (pp. 531-537). Academic Press.

Das, Swarnamoni, Borah, Mukundam and Ahmed, Shagufa (2013). Antibacterial activity of the ethanolic extract of leaves of *Citrus maxima* (Burm.) Merr. on Escherichia coli and Pseudomonas aeruginosa. *Asian J. Pharmaceutical & Clinical Res.*, **6**(4) :136-139.

Dinesh, S. S. and Hegde, K. (2016). Antiobesity activity of ethanolic extract of Citrus maxima leaves on cafeteria diet induced and drug induced obese rats. *Res. J. Pharmacy & Technol.*, **9**(7) : 907-912.

Doymaz, Ý. and Karasu, S. (2018). Effect of air temperature on drying kinetics, colour changes and total phenolic content of sage leaves (*Salvia officinalis*). *Quality Assurance & Safety of Crops & Foods*, **10**(3):269-276.

Draz, S.N., Ali, A.M.F., Hussein, K.E. and Afifi, A.K.S. (2021). A Comparative Study between Green Tea (*Camellia sinensis*) and Common Sage (*Salvia officinalis*) (Chemical Composition and Active Compounds). *Menoufia J. Agric. Biotechnol.*, **6**(1):11-21.

Ekpiken, S.E., Nfongeh, J.F. and Bassey, E.E. (2021). Antibacterial properties of Senna alata and *Citrus sinensis* leaves extracts against some selected bacteria isolated from fish ponds in Calabar metropolis. *World J. Pharmacy & Pharmaceutical Sci.*, **10**(3) : 1777-1793.

Ekwenye, U.N. and Edeha, O.V. (2010). The antibacterial activity of crude leaf extract of *Citrus sinensis* (sweet orange). *International J. Pharma & Bio Sci.*, **1**(4) : 743-750.

Enejoh, O.S., Ogunyemi, I.O., Bala, M.S., Oruene, I.S., Suleiman, M.M. and Ambali, S.F. (2015). Ethnomedical importance of *Citrus aurantifolia* (christm) swingle. *The Pharma Innovation*, **4**(8, Part A), 1.

Ezeabara, C.A. and Dikeh, R.C. (2019). Evaluation of Phytochemical Composition and *in vitro* Antimicrobial Activity of Various Parts of Citrus Grandis Osbeck. *Pharmacophore*, **10**(5).

Fahmy, N.M., Elhady, S.S., Bannan, D.F., Malatani, R.T. and Gad, H.A. (2022). *Citrus reticulata* Leaves Essential Oil as an Antiaging Agent: A Comparative Study between Different Cultivars and Correlation with Their Chemical Compositions. *Plants*, **11**(23) : 3335.

Farnad, N., Heidari, R. and Aslanipour, B. (2014). Phenolic composition and comparison of antioxidant activity of alcoholic extracts of Peppermint (*Mentha piperita*). *J. Food Measurement & Characterization*, **8** : 113-121.

Feksa, D.L., Coelho, R.P., da Costa Güllich, A.A., Dal Ponte, E.S., Piccoli, J.D.C.E. and Manfredini, V. (2018). Extract of *Citrus maxima* (pummelo) leaves improve hepatoprotective activity in Wistar rats submitted to the induction of non-alcoholic hepatic steatosis. *Biomedicine & Pharmacotherapy*, **98** : 338-346.

Gadaka, M.A., Muazu, A.B. and Muhammad, I.U. (2021). Phytochemicals and Elemental Analysis of Methanol Leave Extract of Peppermint Tea (*Mentha piperita* L.).

Garcia, A.R., Amaral, A.C.F., Azevedo, M.M., Corte-Real, S., Lopes, R.C., Alviano, C.S., ... & Rodrigues, I.A. (2017). Cytotoxicity and anti-Leishmania amazonensis activity of *Citrus sinensis* leaf extracts. *Pharmaceutical Biology*, **55**(1) : 1780-1786.

Grulova, D. and Salamon, I. (2013). Essential oil composition of garden sage tea from different origin. *Біологічні системи*, (5, Вип. 4), 475-478.

Hamrouni-Sellami, I., Rahali, F.Z., Rebey, I.B., Bourgou, S., Limam, F. and Marzouk, B. (2013). Total phenolics, flavonoids, and antioxidant activity of sage (*Salvia officinalis* L.) plants as affected by different drying methods. *Food & Bioprocess Technol.*, **6**(3) : 806-817.

Hayat, K. (2020). Impact of drying methods on the functional properties of peppermint (*Mentha piperita* L.) leaves. *Sci. Lett*, **8** : 36-42.

Ibrahim, F.A., Usman, L.A., Akolade, J.O., Idowu, O.A., Abdulazeez, A.T. and Amuzat, A.O. (2019). Antidiabetic potentials of Citrus aurantifolialeaf essential oil. *Drug Res.*, **69**(04) : 201-206.

Ýlyasoðlu, H. and Zemzemoðlu, T. E. A. (2022). Effect of Brewing Conditions on Sensorial and Antioxidant Properties of Sage Tea. *Kahramanmaraþ Sütçü Ýmam Üniversitesi Tarým ve Doða Dergisi*, ***25***(Ek Sayý 1) : 214-221.

Islam, A., Tasnin, M., Bari, M.W., Hossain, M.I. and Islam, M.A. (2021). *In vitro* Antioxidant and *in vivo* Antidiabetic Properties of *Citrus maxima* Leaf Extracts in Alloxan-Induced Swiss Albino Diabetic Mice. *Asian Food Sci. J.*, **20**(2) : 66-79.

Jabamalairaj, A., Dorairaj, S., Yadav, S.A. and Bathrachalam, C. (2015). Detection of functional group and antimicrobial activity of leaf extracts of *Citrus grandis* (L.) against selected clinical pathogens. *Indo Am. J. Pharm. Res*, **5**(5) : 1442-1448.

Jain, S., Arora, P. and Popli, H. (2020). A comprehensive review on Citrus aurantifoliaessential oil: its phytochemistry and pharmacological aspects. *Brazilian J. Natural Sci..* **3**(2) : 354-364.

Kamiloglu, S., Toydemir, G., Boyacioglu, D. and Capanoglu, E. (2012). Health perspectives on herbal tea infusions. *Phytoterapeutics*, *43*, 353-68.

Kasali, A.A., Lawal, O.A., Abanikannda, O.T., Olaniyan, A.A. and Setzer, W.N. (2010). Citrus Essential Oil of Nigeria Part IV: Volatile Constituents of Leaf Oils of Mandarins (*Citrus reticulata* Blanco) From Nigeria. *Records of Natural Products*, **4**(3) :156.

Kim, H., Moon, J.Y., Mosaddik, A. and Cho, S.K. (2010). Induction of apoptosis in human cervical carcinoma HeLa cells by polymethoxylated flavone-rich Citrus grandis Osbeck (Dangyuja) leaf extract. *Food & Chemical Toxicology*, **48**(8-9) : 2435-2442.

Kumar, A. and Mishra, K. (2020). Anti-Inflammatory and Anti-Nociceptive Activity of Bioactive Fractions from Leaves of *Citrus sinensis*. *Internat. J. Sci. & Res.,* **9** (10) : 276-280.

Kundu Sen, S., Gupta, M., Mazumder, U.K., Haldar, P.K., Saha, P., Bhattacharya, S., ... and Bala, A. (2011a). Antihyperglycemic effect and antioxidant property of Citrus maxima leaf in streptozotocin-induced diabetic rats. *Diabetologia Croatica*, **40**(4).

Kundu Sen, S., Gupta, M., Mazumder, U.K., Haldar, P.K., Saha, P. and Bala, A. (2011b). Antitumor activity of Citrus maxima (Burm.) Merr. leaves in ehrlich's ascites carcinoma cell-treated mice. *International Scholarly Research Notices*, *2011*.

Lemes, R.S., Alves, C.C., Estevam, E.B., Santiago, M.B., Martins, C.H., Santos, T.C.D., ... and Miranda, M.L. (2018). Chemical composition and antibacterial activity of essential oils from *Citrus aurantifolia* leaves and fruit peel against oral pathogenic bacteria. *Anais da Academia Brasileira de Ciências*, **90** : 1285-1292.

Lima, C.F., Fernandes-Ferreira, M. and Pereira-Wilson, C. (2007). Drinking of Salvia officinalis tea increases CCl4-induced hepatotoxicity in mice. *Food & Chemical Toxicol.*, **45**(3) : 456-464.

Lota, M.L., de Rocca Serra, D., Tomi, F. and Casanova, J. (2000). Chemical variability of peel and leaf essential oils of mandarins from *Citrus reticulata* Blanco. *Biochemical Systematics & Ecol.*, **28**(1) : 61-78.

Mahendran, G. and Rahman, L.U. (2020). Ethnomedicinal, phytochemical and pharmacological updates on Peppermint (Mentha x piperita L.)—A review. *Phytotherapy Research*, **34**(9) : 2088-2139.

Mainasara, M.M., Bakar, M.F.A., Waziri, A.H. and Musa, A.R. (2018). Comparison of phytochemical, proximate and mineral composition of fresh and dried peppermint (*Mentha piperita*) leaves. *J. Sci. & Technol.*, **10**(2).

Malekmohammad, K., Rafieian-Kopaei, M., Sardari, S. and Sewell, R.D. (2021). Toxicological effects of Mentha x piperita (peppermint): A review. *Toxin Reviews*, **40**(4) : 445-459.

Mannucci, C., Calapai, F., Cardia, L., Inferrera, G., D'Arena, G., Di Pietro, M., ... and Calapai, G. (2018). Clinical Pharmacology of Citrus aurantium and *Citrus sinensis* for the Treatment of Anxiety. *Evidence-based complementary and alternative medicine: eCAM*, *2018*.

Matsingou, T.C., Petrakis, N., Kapsokefalou, M. and Salifoglou, A. (2003). Antioxidant activity of organic extracts from aqueous infusions of sage. *J. Agri. & Food Chem.*, **51**(23) : 6696-6701.

McKay, D.L. and Blumberg, J.B. (2006). A review of the bioactivity and potential health benefits of peppermint tea (*Mentha piperita* L.). *Phytotherapy Research: An Internat. J. Devoted Pharmacological & Toxicological Evaluation of Natural Product Derivatives*, **20**(8) : 619-633.

Mohammed, N., Sanyinna, Y.M. and Ahmed, R.N. (2021). Anti-Bacterial and Anti-Fungal Activities of *Citrus sinensis* Leaves Extracts. *Intermat. J. Sci. Res. Biological*

Sciences, **8**(6).

Moon, J.Y., Kim, H., Cho, M. and Chang, W.Y. (2009). Induction of Apoptosis in SNU-16 Human Gastric Cancer Cells by the Chloroform Fraction of an Extract of Dangyuja (*Citrus grandis*) Leaves. *J. Korean Soc. Appl. Biol. Chem*, **52**(2) : 168-175.

Musdja, M. Y., Pariwidjayanti, A. M. and Agusta, A. (2017, August). Activity Test and Inhibitory Mechanism of Essential Oil of Lime Leaf (*Citrus aurantifolia*, Swingle) Against Some of Bacterial Pathogens. In *International Conference on Science and Technology (ICOSAT 2017)-Promoting Sustainable Agriculture, Food Security, Energy, and Environment Through Science and Technology for Development* (pp. 42-50). Atlantis Press.

Narang, N. and Jiraungkoorskul, W. (2016). Anticancer activity of key lime, Citrus aurantifolia. *Pharmacognosy Reviews*, **10**(20) : 118.

Nasri, M., Bedjou, F., Porras, D. and Martínez-Flórez, S. (2018). Antioxidant, anti-inflammatory, and analgesic activities of *Citrus reticulata* Blanco leaves extracts: an in vivo and in vitro study. *Phytothérapie*, **16**(S1) : S130-S142.

Nazir, S., Afroz, S., Younis, M., Sodhar, U., Ain, Q., Kanwal Naseer, A. and Ara, A. (2023). Phytochemical Analysis and Coagulation Effect of *C. aurantifolia* Swingle Leaves and *A. fistulosum*. *J. Xi'an Shiyou University, Natural Science Edition,* **19**(10) : 437-450.

Nie, Q.X., Zhang, Q.X., Zhu, Y.J., Wu, P.J., He, Y.L. and Wang, J.Y. (2022). Relationship between the UPLC Fingerprints of *Citrus reticulata* "Chachi" Leaves and Their Antioxidant Activities. *Internat. J. Analytical Chemistry*, *2022*.

Nweke, F.U. (2015). Effect of *Citrus aurantifolia* leaf extract on mycelial growth and spore germination of different plant pathogenic fungi. *Advances in Life Science and Technology Journal*, **31** : 4-9.

Oderinde, O., James, O., Shagari, A., Bashar, K. and Bilbis, F. (2016). Phytochemical Analysis and *in vitro* Screening of *Citrus aurantifolia*. Leaf Extracts for Schizonticidal Activity on Clinical Isolates of Plasmodium falciparum. The Beam. J. Arts & Sci., **9** : 81.

Oliveira, E.D., Leite, T.S., Silva, B.A. and Conde-Garcia, E. A. (2005). Inotropic effect of *Citrus sinensis* (L.) Osbeck leaf extracts on the guinea pig atrium. *Brazilian J. Medical & Biological Res.*, **38** : 111-118.

Patenkovic, A., Stamenkovic-Radak, M., Banjanac, T. and Andjelkovic, M. (2009). Antimutagenic effect of sage tea in the wing spot test of Drosophila melanogaster. *Food & Chemical Toxicol.*, *47*(1), 180-183.

Pedro, D.F., Ramos, A.A., Lima, C.F., Baltazar, F. and Pereira Wilson, C. (2016). Colon cancer chemoprevention by sage tea drinking: decreased DNA damage and cell proliferation. *Phytotherapy Res.*, **30**(2) : 298-305.

Potdar, V.H. and Kibile, S.J. (2011). Evaluation of antidepressant-like effect of *Citrus maxima* leaves in animal models of depression. *Iranian J. Basic Medical Sci.*, **14**(5) :478.

Prabahar, T. (2018). *Bioprospective of Citrus sinensis Linn. Leaves: Its Volatile Oil as a Weapon on Convulsion in Zebra Fish Larvae Seizure Model* (Doctoral dissertation, College of Pharmacy, Madurai Medical College, Madurai).

Prabahar, T., Yoganandam, G. P., Rekha, J.B., Kumar, M. and Venkateswarlu, B.S. (2022). Phytoanalytical and Phytochemical Investigation of Essential Oils of Leaves of Two Major Commercial Varieties *Citrus aurantium* L. and *Citrus sinensis* L. *Rasayan J. Chem.*, **15**(4).

Prusty, A.K. and Patro, S.K. (2014). Study of *in vitro* antibacterial activity of leave extract of *Citrus maxima*. *Ann. Plant Sci.*, **12**(3) : 899-904.

Rowshan, V. and Najafian, S. (2013). Headspace analyses of leaf and flower of *Citrus limetta* (Lemon), *Citrus maxima* (Pomelo), *Citrus sinensis* (Orange), and *Citrus medica* (Cedrum) for volatile compounds by CombiPAL system technique. *J. Herbs, Spices & Medicinal Plants,* **19**(4) : 418-425. DOI: 10.1080/10496475.2013.818605

Sá, C.M., Ramos, A.A., Azevedo, M.F., Lima, C.F., Fernandes-Ferreira, M. and Pereira-Wilson, C. (2009). Sage tea drinking improves lipid profile and antioxidant defences in humans. *Internat. J. Molecular Sci.*, **10**(9): 3937-3950.

Salawu, S.O. and Akinseye, O.R. (2017). Influence of Oral Administration of Peppermint Tea on Biochemical and Histological Markers of the Liver of Wistar Rats. *Group*, **60**, 2017.

Sapkota, B. and Jain, V. (2021). Evaluation of anti-ulcer activity of *Citrus maxima* (brum.) leaves extract in experimental animals. *J. Clinical & Experimental Pharmacol.*, **11**(2) : 1-6.

Sharma, Y., Fagan, J. and Schaefer, J. (2019). Ethnobotany, phytochemistry, cultivation and medicinal properties of Garden sage (*Salvia officinalis L.*). *J. Pharmacognosy & Phytochemistry*, **8**(3) : 3139-3148.

Shchérazade, O.S.F., Pétronille, A.Z., Joseph, F.K.Y. and Georges, A. (2021). Study of the Analgesic Effect of the Aqueous Extract of the Leaves of *Citrus aurantifolia* (Rutaceae) in Mice. *GSC Biological & Pharmaceutical Sci.*, **14**(3) : 207-214.

Sheik, H.S., Vedhaiyan, N. and Singaravel, S. (2014). Evaluation of central nervous system activities of Citrus maxima leaf extract on rodents. *J. Appl. Pharmaceutical Sci.*, **4**(9) : 077-082.

Siddique, S., Javed, S., Nawaz, S., Perveen, Z., Khan, R.A., Khanum, R. and Shahzad, K. (2012). Volatile components and antimicrobial activity of *Citrus sinensis* var. mosammi leaves oil. *Electron J. Environ. Agric. Food Chem.*, **11** : 172-179.

Sohi, S. and Shri, R. (2018). Comparative Pharmacognostic Evaluation of Leaves of *Citrus sinensis* Var. Jaffa and Citrus paradisi var. Redblush. *Pharmacognosy Communications*, **8**(1) : 43-48.

Walch, S.G., Tinzoh, L.N., Zimmermann, B.F., Stühlinger, W. and Lachenmeier, D.W. (2011). Antioxidant capacity and polyphenolic composition as quality indicators for aqueous infusions of *Salvia officinalis* L. (sage tea). *Frontiers in Pharmacology*, **2** : 79.

Yang, E.J., Lee, H.J., Kang, G.J., Park, S.S., Yoon, W.J., Kang, H.K., ... and Yoo, E.S. (2009). Anti-Inflammatory effect of Dangyuja (*Citrus grandis* osbeck) Leaves in LPS-Stimulated RAW 264.7 Cells. *Food Sci. & Biotechnol.*, **18**(5) : 1063-1070

Ye, Y., Xu, G. and Li, D.L. (2022). Acridone alkaloids and flavones from the leaves of Citrus reticulata. *Natural Product Res.*, **36**(14) : 3644-3650.

****