



REVIEW ARTICLE

Medicinal Significance, Phytochemical Composition and Pharmacological Properties of *Prunus persica* (L.): A Review

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Abstract

Peaches, scientifically named *Prunus persica* Linn., are a member of the Rosaceae family and are widely consumed for their nutritional and therapeutic properties.

This review summarizes the phytochemical composition and pharmacological activities of *Prunus persica* based on a structured literature search conducted across PubMed, Scopus, Web of Science, and Google Scholar databases. Evidence indicates that peach contains bioactive compounds, including flavonoids, phenolic compounds, carotenoids, and cyanogenic glycosides, which exhibit antioxidant, anti-inflammatory, anti-microbial, and anti-cancer activities through mechanisms involving oxidative stress modulation, inflammatory pathway inhibition, and regulation of cellular signaling pathways. Most findings are derived in vitro and animal studies, while clinical evidence remains limited. Overall, *Prunus persica* demonstrates promising pharmacological potential; however, further clinical investigations are required to validate therapeutic applications.

Therefore, *Prunus persica* is a versatile medicinal plant with multiple pharmacological importance and may be used therapeutically in the near future. More research is required to examine its comprehensive potential for wellness and health-related to the present sources of bioactive compounds.

Keywords: Peach, *Prunus persica*, Anti-oxidant, Anti-inflammatory, Anti-cancer, Anti-microbial, Anti-allergy

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Introduction

Peach (*Prunus persica* L.) is a member of the Amygdaloideae sub-family of the Rosaceae family. It is frequently credited as "Aaru" and is extensively consumed globally; in English, it is generally known as "Peach" ¹. According to World Health Organization (WHO), 80% of the population use herbal products and the use of folk medicines is universally followed in cultures. Herbal medicine is the core of Korean Medicine. The literature search reveals that peach has traditionally been widely used for pediatric respiratory illnesses, including the common cold. Author Soo-Dam Kim et al. conducted a literature review of Herbal Medicine to evaluate the efficacy and safety of use of Peach for the common cold. Their findings concluded that significant improvement was observed by the use of

the Herbal Medicine of Peach alone, and overall symptoms were improved compared to Conventional Medicine ². Since the 17th century, peaches have been grown throughout the United States. They are native to China. Fruits and vegetables are the most widely used products of all the horticulture crops ³. They are consumed raw or little processed because their nutrients and chemicals promote wellness ⁴. A popular fruit enjoyed all over the world, peaches have been a part of the human being's diet for ages.

Peaches are a staple food in the human diet and can be consumed fresh, dried, or frozen. It has a significant role in human nutrition. It is the most popularly consumed fruit in the world due to its flavor and taste and its importance to economics and nutrition ⁵.

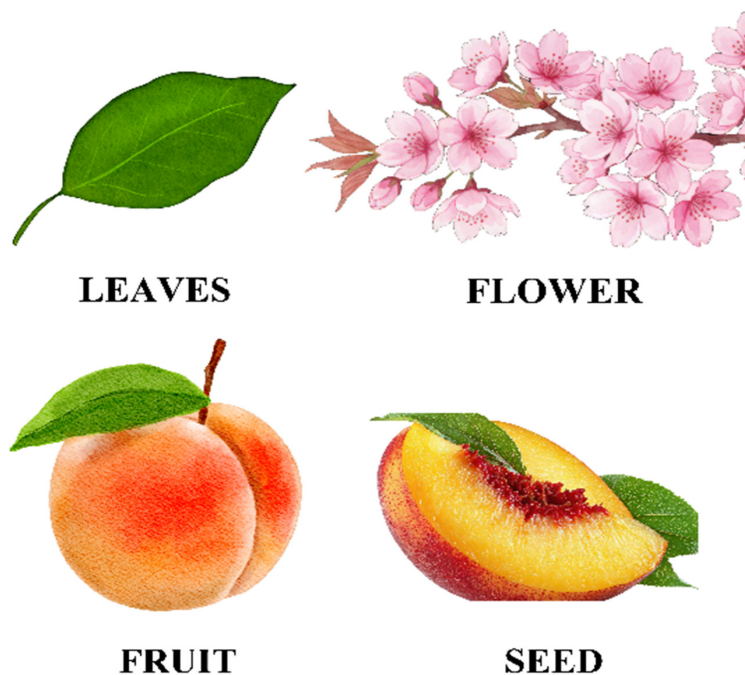


Figure 1: Image of Different Parts of the Peach (Leaves, Flower, Fruit, and Seed)

It is native to temperate zones but originally came from China.⁶ A Literature search revealed that trees' Leaves, fruits, and bark have promising pharmacological activities, such as anti-microbial, anti-cancer, anti-inflammatory, anti-oxidant, anti-allergic, and spasmogenic activity.

While the majority of the fruits and seeds of *Prunus* are generally utilized for their anti-oxidant and anti-cancer properties, the green leaves of the plant are also very beneficial as an astringent, demulcent, diuretic, expectorant, febrifuge, laxative, and parasiticide action⁷.

This short review focuses on investigating the potential benefits of the pharmacological activities of peach fruit (*Prunus persica* L). This review was derived from the research published in scientific articles and books over the past 25 years. The central focus was the Phytochemical and Pharmacological properties of the peach due to its significant role in medicinal use. The document emphasizes studies conducted by various national and international researchers; their scientific contributions have enhanced the understanding of the medical significance of Peach in Pharmacological and Phytochemical Properties.

Botanical Description

Plant Morphology

Leaves

The peach plants' leaves are flat, alternate to one another, with pinnately vented glands and small stipules⁸.

Flowers

In early spring, peach blossoms bloom long before the leaves. They are single or united, bisexual, pink in color, and pubescent on the outside of the sepals; the petals and stamens are inserted together with the petals into the sepal tube⁹.

Fruit

The fruits, also called nectarine is a smooth-skinned cultivator of *Prunus persica* distinguished by the absence of fruit pubescence. The yellow or white pulp covers the seeds, which have a hard shell and a delicate scent. The fruits ripen in August-September¹⁰.

Seeds

Peaches are stone fruits (seeds). Their single, large grain is reddish brown, oval-shaped, and surrounded by wood-like scales.

Method

This review was conducted following a structured literature search strategy to ensure transparency and reproducibility. Scientific databases, including PubMed, Scopus, Web of Science, Google Scholar, and Science Direct, were systematically searched for relevant studies between 2000 and 2026. The search was performed using a combination of keywords such as *Prunus persica*, peach phytochemistry, peach pharmacological activity, antioxidant activity of peach, anti-inflammatory properties of peach, and peach bioactive compounds.

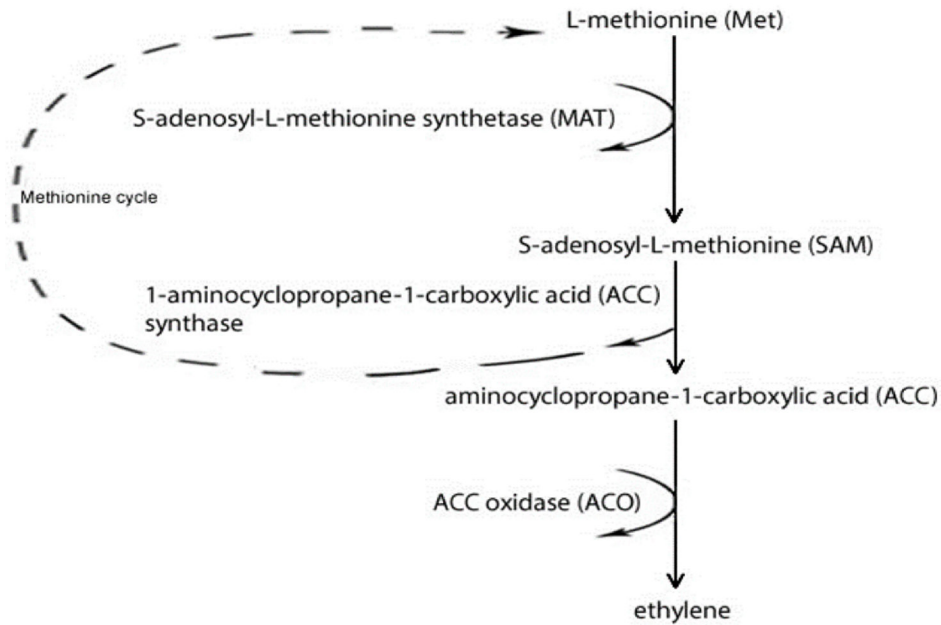


Figure 2: Ethylene Biosynthesis in Peach ¹¹.

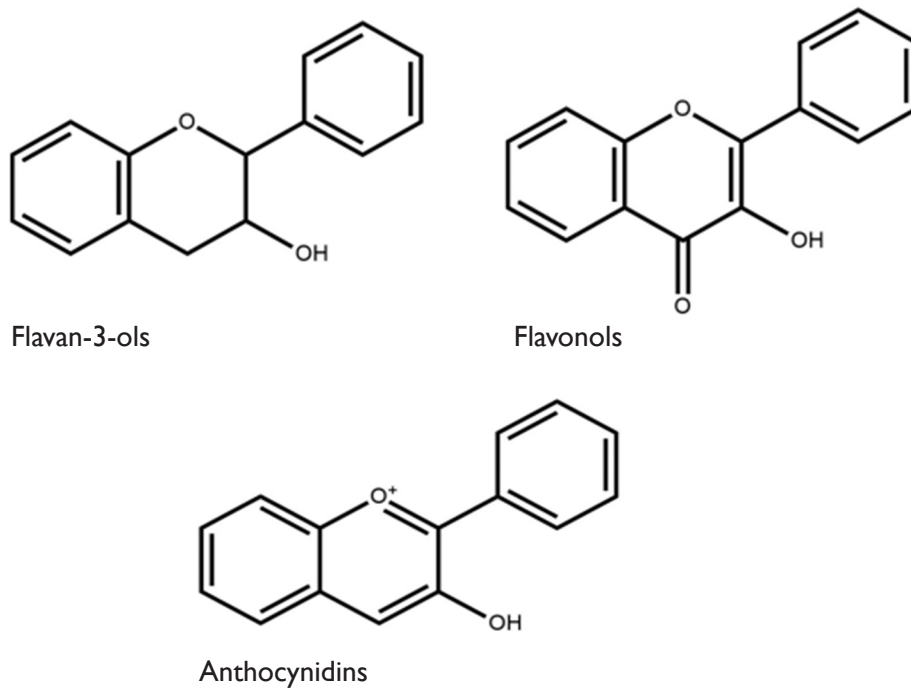


Figure 3: Chemical Structure of Flavanoid classes detected in Peach ²⁶.

The inclusion criteria include peer-reviewed research articles, experimental in vitro, in vivo, or clinical studies, and studies reporting phytochemical or pharmacological properties.

The exclusion criteria follow non-scientific reports, conference abstracts without full data, duplicate studies, and studies unrelated to medicinal properties.

Data extraction focused on phytochemical constituents, pharmacological mechanisms, experimental models, and reported biological effects.

Molecular Mechanism of Peach

Peach (*Prunus persica*) molecular mechanisms are inherently complex and of biological interest as it serves as a model organism of the *Rosaceae* family due to its relatively small, 227.4 Mb haploid genome, which allows the study of the genetic and epigenetic factors determining its developmental process ¹¹. Peach is characterized as climacteric, and a radically enhanced respiration rate and ethylene synthesis via a dynamic crosstalk of auxin and ethylene occur. In this network, the types of biosynthetic

Table 1: Anti-oxidant activity of *Prunus persica L.*

S.NO.	Author	Chemical Constituents	Mode of Action	Ref
1	Corcoran et al., 2012.	Flavonoids	The existence of conjugated double bonds and carbonyl groups in flavonoids remains stable and delocalized. With numerous hydroxyl groups, these molecules show strong antioxidant and chelating tendencies in vitro.	22
2	Yao, X.-C, et al. 2013.	Hydroxycinnamates (ferulic acid)	It minimizes the effects of free radicals in neuronal cell systems that lead to neuronal impairment. Ferulic acid decreases the oxidative stress on the synaptosomal membrane systems, underlining a rise in hydroxyl and peroxy radicals.	21
3	Yao, X.-C, et al. 2013.	Peach gum-derived oligosaccharides (PGDO)	The degrees obtained by PGDO and PGDAC demonstrated a high scavenging activity. Hydroxyl radicals (HO•) are highly reactive to all ROS and cause extensive degradation of biomolecules, whereas DPPH• is a stable free radical. HO• and DPPH• have been extensively used to measure anti-oxidants' free radical scavenging activities.	21
4	Lv Q et al., 2021.	Polyphenols	Tartaric and citric acid, which are acidic in nature, cause oxidation, and increased chelation of phenolic compounds with metal ions causes this process.	23
5	Roabaczewskai et al.,	Glutathione	Glutathione contains a highly redox-sensitive sulfhydryl group that affords protection against oxidant damage by anti-oxidant enzymes and other non-enzymatic anti-oxidants. Glutathione can easily be oxidized to Glutathione Disulfide, which can be converted back to GSH in the existence of Nicotinamide Adenine Dinucleotide Phosphate and Flavin Adenine Dinucleotide-dependent Glutathione Reductase.	24
6	Jovanovic et al., 1994	Flavanols (quercetin)	The formation of intramolecular hydrogen bonds directly through the reaction with free radicals, reactions containing enzymes and free radicals. In vivo and in vitro studies have found that quercetin could greatly enhance oxidative damage and suppress NF-κB activation to prevent tissue harm.	25
7	Lv Long et al., 2021	Kaempferol 3-glucoside	It reduces inflammation due to intensive exercise. Thus, Kaempferol exerted a significant anti-oxidation stress effect in the cellular model stimulated by fatty acids.	23

involved are auxin response factors (ARFs) and Aux/IAA genes which are up-regulated by auxin and ethylene respectively^{12, 13}.

The ethylene biosynthetic pathway involves a three-step enzyme cascade, which is L-methionine to S-adenosyl-methionine (SAM) via methionine adenosyl-transferase (MAT), SAM to 1-aminocyclopropane-1-carboxylate (ACC) via ACC synthase (ACS), followed by ACC oxidase (ACO). Figure 2 explains the Enzyme Cascade Pathway of Peach.

Additional phytohormones are of vital importance: abscisic acid (ABA) peaks at full ripeness, which facilitates fruit softening and sugar accumulation, and gibberellins (GAs) and jasmonates (JAS) tend to retard the ripening process and potentially interact with stress-responsive genes^{11, 14}.

Phytochemical & Pharmacological Composition of Peach fruit (*Prunus persica L*)

Anti-oxidant Activity

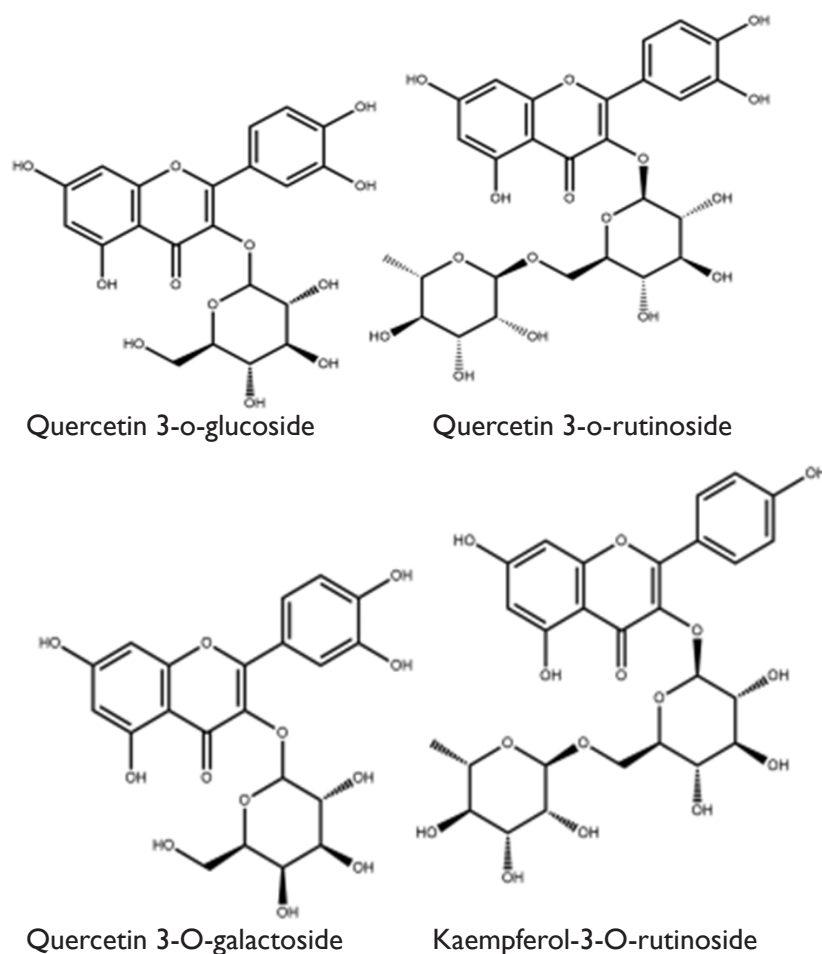
Anti-oxidants can compete with other oxidative substrates by either delaying or inhibiting the reaction to these substrates. These can be enzymes, or compounds such as β-carotene, ascorbic acid, or phenolic compounds¹⁵. Anti-oxidants have the following properties: reducing potential as electron donors, the ability to delocalize and stabilize the unpaired electron, the ability to chelate metal, and to react with other anti-oxidants¹⁵. Peaches are rich in natural anti-oxidants such as phenolic compounds flavonoids, and anthocyanins (Table 1).

Phenolic compounds produced from plant metabolism have an anti-oxidant nature due to the presence of hydroxyl groups and a carbonyl group that enhances their anti-oxidant activity¹⁶. As shown in Figure 3, Flavonoids are molecules with low molecular weight, and their anti-oxidant nature depends on the number and position of hydroxyl groups, the double bond between C-2 and C-3 and 4-oxo group in the C ring, and the catechol group (ortho-dihydroxyl) in the B ring¹⁶⁻¹⁸. Some flavonoids, such as kaempferol, have an additional hydroxyl group in C-3 that enhances its radical-scavenging activity¹⁶.

Carotenoids are a class of pigments found in all photosynthetic organisms. β-cryptoxanthin and β-carotene are the carotenes present in peaches that can reduce

Table 2: Anti-inflammatory activity of *Prunus persica* L.

S.NO.	Author	Chemical Constituents	Mode of Action	Ref
8	Shin et al., 2010.	Quercetin & Catechin	It controls calcium influx and NF-kB signaling pathways.	30
9	Shin et al., 2010.	Persicaside	The substance blocks the activity of both inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 (COX-2) enzymes to reduce nitric oxide (NO) and prostaglandin E2 (PGE2) production.	30
10	Seo et al., 2020.	Cyanogenic glycosides: amygdalin and prunasin	According to Western Blot and reverse transcription polymerase chain reaction analysis, PPB down-regulated the expression of diverse evidence of pro-inflammatory enzymes, including nitric oxide synthase and cyclooxygenase.	31
11	Elshamy et al., 2019.	Flavonoids	Both naringenin and apigenin glycosides have an anti-inflammatory effect on both phases of carrageenan-induced edema. The early phase is linked to changes in vascular permeability, and the late phase with increased synthesis of prostaglandins.	32

**Figure 4:** Chemical Structure of Phenolic Compounds reported in Peach ²⁶.

chronic and degenerative diseases, including diseases triggered by reactive oxygen species (ROS) ^{19,20}.

The anti-oxidant assays analyzed peach gum-derived oligosaccharides' (PGDO) free radical-scavenging ability. The PGDO has shown positive results for both hydroxyl radical-scavenging activity and DPPH radical-scavenging activity ²¹.

Although multiple studies demonstrate the antioxidant potential of *Prunus persica*, most evidence originates from in vitro assays, which may not accurately represent

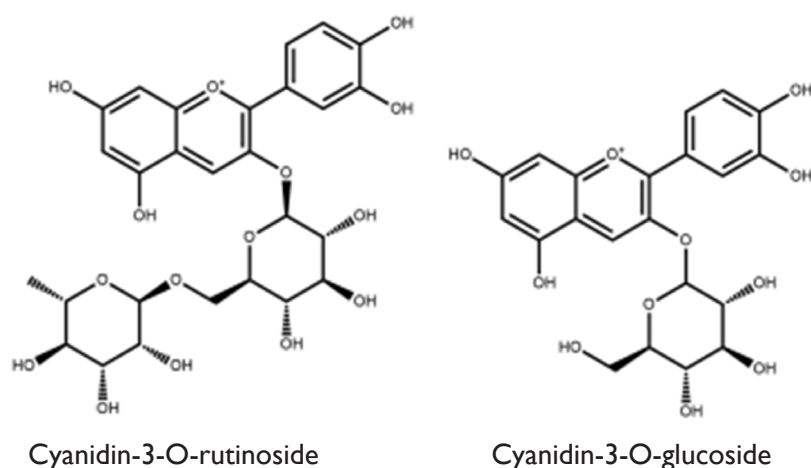
physiological conditions. Variations in extraction methods and cultivar differences also contribute to inconsistent findings across studies. Therefore, standardized experimental designs and clinical validation are necessary.

Anti-inflammatory Activity

Inflammation is a pathophysiological phenomenon of the human body featuring redness, edema, fever, aches, and functional loss that can be due to pathogenic infection or tissue damage ^{27,28}. This natural response occurs when

Table 3: Anti-inflammatory activity of *Prunus persica* L.

S.NO.	Author	Chemical Constituents	Mode of Action	Ref
12	Noratto et al., 2014	Polyphenols (cyaniding 3 β -glucoside, quercetin 3 β -rutinoside, chlorogenic acid, neochlorogenic acid, quercetin 3 β - glucoside and catechin derivatives)	A literature search shows that polyphenolics isolated from peaches suppress the number of tumors formed and the MDA-MB-435 breast cancer cells' metastasis along with the angiogenesis process.	33
13	Heo et al., 2001	Flavonoids Anthocyanins	They demonstrated a decrease in tumor rate, tumor number, and tumor latency period. UVB causes keratinocyte DNA damage both in p53+ and p53—cells, forming cyclo-butane dimers and photoproducts. A part of this DNA damage is now known to be rectified through enzymatic pathways catalyzed through endonucleases. The aforementioned open lesions leave undemolished mutations in the target genes and trigger skin cancer.	38
14	Hernández et al., 2018	Peptides	Peptides can bind to target receptors on the tumor cell surface and exert effects that suppress growth. They may also stimulate signal-transduction routes that result in the death of cancer cells through apoptosis. These peptides can also inhibit protein Synthesis and, therefore, slow down or halt the growth of cancer cells.	39
15	Fukuda et al., 2003	Glycosides	A literature search revealed that Glycosides in <i>Prunus persica</i> showed EBV-EA activation without exhibiting cytotoxicity and had a relatively strong anti-tumor-promoting effect	40
16	Koyu et al., 2020	Phenols	They suppress tumor cells and promote apoptosis by controlling cell cycle arrest, signal transduction pathways, carcinogen metabolism and enzymes, oncogene gene expression, and angiogenesis.	41
17	Shen et al., 2017	Flavanols and Fatty Acids (ethanol extract)	These constituents can reduce HepG2 cell viability and suppress cell and tumor growth by inhibiting migration through cell cycle arrest. It can also exert anti-tumor effects on freshly implanted HepG2 cells derived in vivo tumors. This data shows that the possible antecedent of HepG2 growth inhibition by <i>Prunus persica</i> extract was cell cycle arrest and migration inhibition.	42

**Figure 5: Chemical Structure of Anthocyanins reported in Peach ²⁶.**

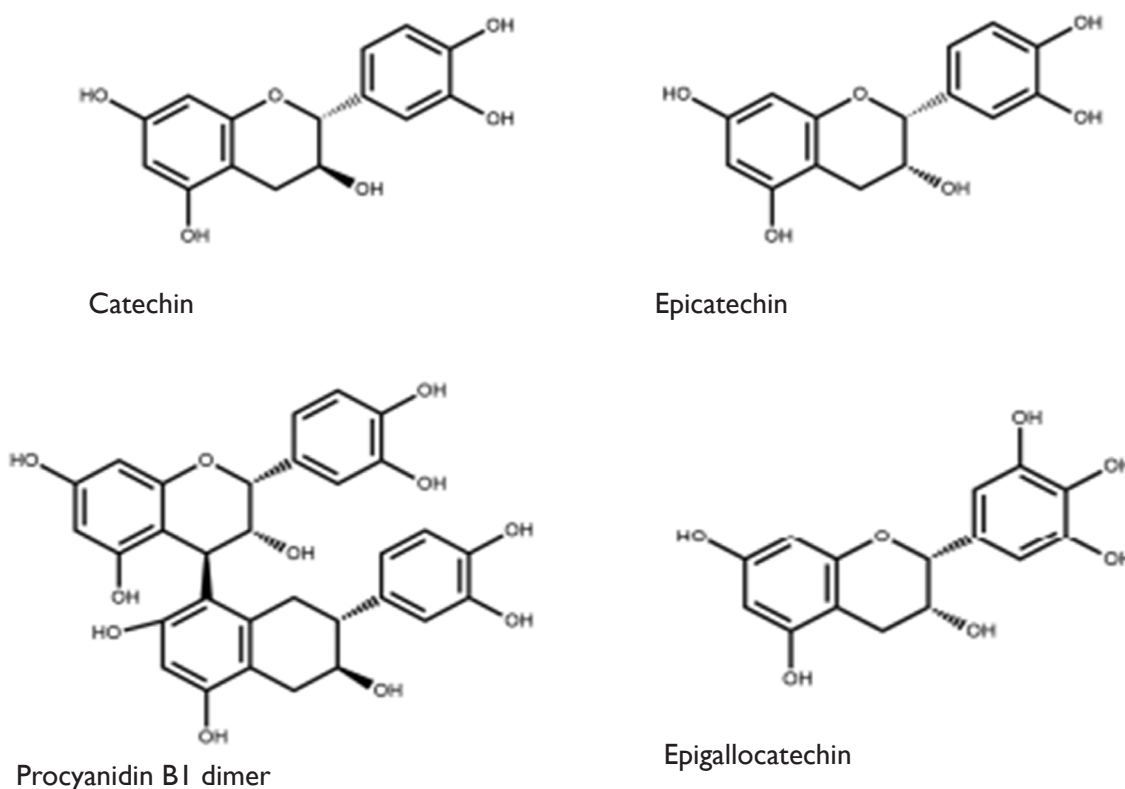
the body's immune system notices invaders like microbes and triggers and produces an inflammatory response. Any disruption in the innate immune system can lead to an inflated response, and inflammation occurs, which can lead to more damage and chronic disorders.

Phenolic compounds (Figure 4) have been suggested as a replacement for preventing or treating chronic inflammatory diseases with their anti-inflammatory and

immunomodulatory activity ^{27, 28} as described in Table 2. Among them, flavonoids are the most associated with this property ^{27, 28}. Examples include quercetin, kaempferol, and rutin, which have been studied in animal models and cell cultures. Rutin was effective in treating arthritis, and quercetin was shown to reduce edema in animal models ^{28, 29}. Flavonoids can lower inflammation by scavenging free radicals, preventing cell damage, and regulating pro-

Table 4: Anti-microbial activity of *Prunus persica* L.

S.NO.	Author	Chemical Constituents	Mode of Action	Ref
18	Atef, Nagwa M., et al., 2019	Flavonoids, Phenolics, Sterols	The leaves exhibit anti-bacterial activity, displaying potent effects against both Gram-negative (<i>E. coli</i> , <i>P. aeruginosa</i>) bacteria and Gram-positive (<i>B. subtilis</i> , <i>S. aureus</i>).	45
19	Abderrahmane Mokrani., 2011	Phenol	The compounds counteract reactive oxygen species (ROS) generated during fruit ripening, providing protection against oxidative damage. The anti-oxidant power is linked to the total phenolic content, which varies among different peach varieties and ripening stages.	46

**Figure 5:** Chemical Structure of Anthocyanins reported in Peach ²⁶.

inflammatory enzymes. They can also downregulate pro-inflammatory gene expression, thereby inhibiting the production of arachidonic acid, prostaglandins, leucotrienes, and NO, which are key mediators of the inflammatory response ^{27, 28}. Quercetin inhibits the liberation of arachidonic acid, which is the precursor of inflammation, by blocking the phospholipase A2 enzyme in human neutrophils ^{27,28}.

Peach peel and fresh pulp-derived products inhibit inflammation mediators such as tumor necrosis factor- α (TNF- α), interleukin IL-1 β and nuclear factor κ B (NF- κ B) ^{19,28}. Mast cells have been targeted in in-vivo models and showed anti-allergic inflammatory effects of the fruit extract ³⁰.

Although multiple studies demonstrate the anti-inflammatory activity of *Prunus persica*, most evidence

originates from in vitro assays, which may not accurately represent physiological conditions. Variations in extraction methods and cultivar differences also contribute to inconsistent findings across studies. Therefore, standardized experimental designs and clinical validation are necessary.

Anti-Cancer Activity

Tumors are abnormal cells that grow and multiply abnormally. Normally, the growth and proliferation of cells in mammals are regulated by a cycle, and any alteration can cause cell abnormality ^{33,34}. Transformed cells grow in a stroma, controlled by tumor cells. Endothelial cells move to new areas and form blood vessels called angiogenesis, as this process supplies nutrients and oxygen to the carcinoma ³³. Angiogenesis transitions to metastasis and spreads to other parts of the body ^{33,35}.

As described in Table 3, Phenolic compounds show their ability to stop cancer development while slowing down the progression of cancer tumors. Flavonoids block carcinogenic factor metabolism by inhibiting cytochrome P450 enzymes as well as phase I enzymes³⁶. Studies have established critical therapeutic effects for flavonoids parallel to non-flavonoids in breast cancer care. The breast tumor cells receive antitumor benefits from flavan-3-ols, flavonols, anthocyanins, and hydroxycinnamate acid derivatives through chlorogenic acid, neochlorogenic acid, epicatechin, catechin, quercetin-3-O-glucoside, quercetin-3-O-rutinoside, and cyanidin-3-O-glucoside (Figures 5 and 6)^{33,37}.

A study using yellow-fleshed peach "Rich Lady" extracts in female mice showed promising results in inhibiting tumor growth, reducing neo-angiogenesis, and inhibiting the expression of certain MMPs genes³³. The Literature search investigated in another study the cytotoxic effects of peach extracts against estrogen-dependent MCF-7, together with estrogen-independent MDA-MB-435 cancer cell lines³⁷.

Although multiple studies demonstrate the anticancer activity of *Prunus persica*, most evidence originates from in vitro assays, which may not accurately represent physiological conditions. Variations in extraction methods and cultivar differences also contribute to inconsistent findings across studies. Therefore, standardized experimental designs and clinical validation are necessary.

Anti-Microbial Activity

Plants use an anti-microbial nature as a part of their defense mechanism and have many anti-microbial components. Phytochemicals in the peach confer strong anti-microbial activity (Table 4). Peachtree fruit and branches produce gum with complex structures in response to any microbial attack or mechanical injury²¹. Different studies have reported the anti-microbial efficacy of peach extracts against some pathogens.

A methanolic extract was prepared by implementing the disc diffusion method on both gram-positive bacteria and gram-negative bacteria specimens. The extract demonstrated both blocking behavior along with inhibition zones for *S. aureus*, *B. subtilis*, *S. epidermidis*, and *Klebsiella pneumoniae* against the bacteria strains tested. The bioactive compounds consisting of β -sitosterol and phenolic compounds together with organic acids and others are responsible for this effect.⁴³

Similarly, ethyl acetate extract from peach leaves showed significant anti-bacterial activity against *E. coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. Results demonstrated that anti-microbial activity is due to the

presence of triterpenoids in ethyl acetate extract⁴⁴.

Although multiple studies demonstrate the anti-microbial activity of *Prunus persica*, most evidence originates from in vitro assays, which may not accurately represent physiological conditions. Variations in extraction methods and cultivar differences also contribute to inconsistent findings across studies. Therefore, standardized experimental designs and clinical validation are necessary.

Conclusion

Peach (*Prunus persica* L.) has been observed to possess several pharmacological activities, all of which have potential health implications. Based on nutrient composition, flavonoids are known to have anti-oxidant effects which reduce peach's ability to form free radicals and perform oxidative damage to cells. The anti-inflammatory properties of the fruit are due to the presence of quercetin, catechin, persic acid, and cyanogenic glycosides that reduce inflammation and inflammation-related enzymes.

Peach also shows significant anti-cancer effects, where components such as polyphenols, flavonoids, peptides, glycosides, and phenols have been reported to show effects, including inhibition of tumors, causing cell destruction, and hindering metastases. Also, the antibiotic effect of the fruit against different pathogens is established because of flavonoids, phenolics, and sterols. The diverse pharmacological effects of Peach suggest potential applications in health promotions.

Future research should focus on identifying and describing other bioactive compounds present in peaches and on their mode of action. Other researchers indicate that an enhanced understanding of how peach phytochemicals interact with other therapeutic compounds may lead to the discovery of new therapies.

Further studies on the phytochemical content of peaches are important for discovering additional uses in treatment and gaining further insight into peaches' beneficial properties. This Literature search reveals that other bioactive components of peaches can be used as drugs and supplements to unlock the maximum therapeutic potential of peaches and support disease risk reduction. Despite promising pharmacological findings, most available evidence is limited to pre-clinical studies. Well-designed clinical trials are required before therapeutic recommendations can be established.

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Conflict of interest

The authors declare that they have no competing interests that can influence the work reported in this work.

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