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The Pomegranate: A Medicinal Plant with Remarkable Benefits

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Abstract

Punica granatum L., or pomegranate, is known for its health benefits. Research shows that pomegranates are a functional food that supports overall health. This review highlights their key properties, especially their antioxidant and anti-inflammatory effects. Pomegranates contain compounds such as polyphenols, flavonoids, and tannins that combat free radicals and reduce oxidative stress, which can contribute to ageing and the development of chronic diseases. Their anti-inflammatory properties help prevent conditions like arthritis and heart disease. Pomegranates also promote skin health, improve hydration, and reduce wrinkles. Their prebiotic qualities support gut health by encouraging good bacteria. Studies suggest that pomegranates can slow the growth of cancer cells, particularly in skin and breast cancers. Pomegranate seed oil is particularly effective against tumour growth. The different parts of the pomegranate plant, including leaves, juice, seeds, and peels, contain beneficial phytochemicals. While evidence supports pomegranates in managing chronic diseases, more research is needed to understand how these compounds work together. Overall, pomegranate shows promise as a natural remedy to enhance health and standard treatments.

Keywords: *Punica granatum L.*; Pomegranate; Medicinal; Ayurvedic

1. Introduction

The pomegranate (*Punica granatum L.*) is a magnificent fruit tree steeped in history, with roots tracing back thousands of years and cultivated across diverse regions worldwide. Known for its striking appearance, the pomegranate boasts a leathery, crimson-hued skin that encases a treasure trove of glistening, ruby-red seeds—each bursting with a delightfully tangy and sweet flavour. Beyond its culinary appeal, this ancient fruit is celebrated for its remarkable health benefits, packed with antioxidants and nutrients that promote overall well-being. Throughout the ages, the pomegranate has been revered as a powerful symbol in various cultures, embodying concepts of life, longevity, and vitality. Its abundance of seeds has led to associations with fertility and prosperity, while its vibrant colour and rich history render it a poignant representation of beauty and magnificence. Furthermore, the pomegranate holds profound spiritual significance, often linked to awareness,

morality, and the cycle of life. As such, it continues to be cherished not only as a food source but also as a poignant emblem of hope and rejuvenation across different traditions [1].

Pomegranates are fascinating fruits that consist of several distinct anatomical parts, each contributing to the fruit's unique appeal and functionality. The interior is filled with glistening, jewel-like seeds known as arils, which are encased in a sweet-tart, translucent membrane. These arils burst with flavour, offering a delightful combination of sweetness and tanginess. Protecting these precious seeds is the robust outer peel, characterised by its thick, leathery texture and vibrant crimson or yellow hue, which serves as a protective barrier against external elements. The pomegranate tree itself boasts lush, glossy leaves that shimmer in the sunlight, creating a beautiful backdrop for the tree's striking flowers. These blossoms, bright red or orange, attract pollinators with their vivid hues and delicate petals, heralding the promise of the fruit to come. The rugged bark of the pomegranate tree is not only visually textured, with shades ranging from deep grey to warm brown, but also serves as a strong support structure, allowing this resilient tree to flourish in a variety of environments. Beneath the surface, the roots spread deep, anchoring the tree firmly and efficiently absorbing essential nutrients and water from the soil. Each component of the pomegranate, from its succulent seeds to its sturdy roots, plays a vital role in the life cycle of the fruit, showcasing the intricate beauty and ecological significance of this remarkable plant[2].

2. Plant Description

The pomegranate (*Punica granatum*) is a deciduous shrub or small tree that typically reaches heights of 15 to 28 feet. It is known for its vibrant, leathery leaves and striking red flowers, which eventually develop into the iconic, round fruit. Each pomegranate is filled with juicy, ruby-red seeds surrounded by a sweet-tart membrane, making it a popular choice for culinary use and health benefits. This hardy plant thrives in warm climates and requires full sun and well-drained soil to flourish, making it a favourite in both home gardens and commercial orchards. Additionally, the pomegranate holds cultural significance in various traditions and is often associated with prosperity and abundance[3].

Shrubs and small trees exhibit extraordinary longevity and possess a rich variety of anatomical features, each intricately designed for specific functions. The seeds, often encased in protective coats, are pivotal for the propagation of new life, ensuring the continuation of their species. The peels, or outer layers, serve as a shield, safeguarding the inner tissues from environmental stressors and pests. Leaves, with their vibrant green hues, play a critical role in the process of photosynthesis, transforming sunlight into the energy that sustains the plant. Bark, encompassing the tree's trunk and branches, not only provides structural integrity but also functions as a barrier against physical damage and infection. The flowers, often a burst of colour and fragrance, are essential for attracting pollinators, thus ensuring successful reproduction through the formation of fruits and seeds. Finally, roots delve deep into the soil, anchoring the plant while simultaneously absorbing vital nutrients and water. Each of these components is not merely a structural element; they also carry a wealth of medicinal properties that have been revered and utilised in both traditional and modern herbal medicine, making these remarkable plants invaluable to both ecosystems and human health[4].

The ripe pomegranate fruit, a stunning example of botanical beauty, is classified as a berry and typically measures between 5 to 12 cm in diameter. Its shape is predominantly round, with a thick, resilient skin that boasts a rich, glossy red hue, occasionally displaying hints of deep burgundy or orange. Inside this vibrant exterior lies a treasure trove of seeds—ranging from 200 to an astonishing 1,400—each one nestled within a delicate, juicy aril. These arils are plump with sweet, tangy nectar, offering a burst of flavour with every bite. The combination of the fruit's striking appearance and its luscious, water-laden pulp makes the pomegranate

not just a fruit, but a delightful sensory experience, celebrated in various culinary traditions for its health benefits and unique taste[5].

3. Systematic Position

Taxonomic Classification of *Punica granatum* L.[6]

- Kingdom: Plantae
- Division: Magnoliophyte
- Class: Magnoliopsida
- Subclass: Rosidae
- Order: Myrtales
- Family: Punicaceae
- Genus: *Punica*
- Species: *Granatum*

4. Traditional Medicinal Uses

Drinking pomegranate juice regularly can boost blood circulation and lower the risk of heart attacks and strokes. The peel, bark, and leaves of the pomegranate can help with stomach issues and diarrhoea. Pomegranate leaf tea is a natural remedy for digestion problems, while the juice may assist with dysentery and cholera. Pomegranate juice has antibacterial and antiviral properties, which can help reduce dental plaque and offer protection against cancer. It may be especially beneficial for people at risk for prostate and breast cancer by lowering PSA levels and slowing cancer growth. Pomegranates can help with atherosclerosis and osteoarthritis by reducing arterial plaque and joint pain. They can also prevent damage to connective tissues. For diabetic patients, pomegranate juice may help prevent heart disease and slow blood vessel hardening. In summary, adding pomegranate to your diet—through juice, fruit, or extract—can support heart health and improve blood flow. Pomegranate seed extract is a good source of iron, which may relieve anaemia symptoms like fatigue and dizziness [7].

5. Health Benefits of Pomegranate

5.1. Anti-Oxidant Activity

Pomegranate juice is packed with polyphenols, which have strong antioxidant properties. Aviram et al. emphasised the benefits of these compounds, especially punicalagin, a key antioxidant in pomegranate juice. Research shows that pomegranate juice has greater antioxidant activity than its components, as it effectively removes harmful free radicals. Liu et al. identified 33 flavonoids in pomegranate juice and its skin, indicating their use in health foods. Faxeli et al. analysed antioxidant capacity in juices from different pomegranate varieties using tests like FRAP and DPPH. Gil et al. found that pomegranate juice has three times the antioxidant capacity of red wine or green tea. Pomegranates also contain beneficial anthocyanins; Gill et al. found that phenolic compounds account for 28% of pomegranates' total antioxidant power. Tucker et al. noted that punicalagin plays a major role in the juice's antioxidant capacity, while anthocyanins have a smaller role.

Overall, polyphenols are the main active ingredients in pomegranates, as shown by Zhang et al.'s studies on the fruits and leaves [8-18].

5.2. Anti-Inflammatory Activity

Nitric oxide (NO) production increases in RAW 264.7 macrophage cells when treated with lipopolysaccharide (LPS). Pomegranate aqueous extracts can reduce this NO production without harming the cells. Lee et al. (2010) found similar results, showing that pomegranate extracts also inhibit NO production. The authors suggested using granatin B as a marker for studying pomegranate's anti-inflammatory effects. In Odisha, India, the Odisha Malaria Research Indigenous Attempt (OMRIA) used herbal treatments made from sun-dried rind of immature pomegranate fruit to help prevent and treat malaria. Ellagic acid (EA), a compound in pomegranate, has strong anti-inflammatory effects. EA can lower inflammation in skin cells by targeting important signalling pathways and might be a good alternative treatment for atopic dermatitis. Ben Saad et al. showed that ellagic acid, gallic acid, and punicalagins A and B can lower the production of NO, prostaglandin E2 (PGE-2), and interleukin-6 (IL-6) triggered by LPS. These compounds are key ingredients in pomegranate that help reduce inflammation. Punicic acid, a fatty acid in pomegranate, is known for its anti-inflammatory properties. It works by lowering the production of prostaglandins, which cause inflammation. Most of these compounds are found in pomegranate seeds. Van De Walle et al. found that polyphenols in cold-pressed pomegranate seed oil can reduce inflammation in colon cancer cells. Pomegranate extract can also lower inflammation by inhibiting nuclear factor kappa B (NF- κ B) activity and reducing ERK1/2 activation. This leads to decreased levels of NO and PGE2 in human intestinal Caco-2 cells[19-23].

6. Conclusion

Pomegranate is a valuable fruit known for its numerous health benefits due to its bioactive compounds. These compounds exhibit antioxidant, anti-inflammatory, anti-ageing, prebiotic, and anti-carcinogenic properties, while also offering protection against metabolic disorders and cardiovascular diseases. Clinical studies suggest that consuming 550 to 650 mg of pomegranate extract daily can provide these benefits. A daily intake of 250 ml of pomegranate juice is also considered adequate for maintaining good health in individuals weighing 70 kg.

Additionally, pomegranate peels are rich in nutrients and beneficial compounds, making them useful for dietary supplements or alternative medicine. Methanolic extracts from these peels demonstrate antioxidant properties similar to those of ascorbic acid. As pomegranate consumption increases, so does the quantity of fruit peels produced. Utilising these peels can help reduce waste and pollution while offering economic advantages to various industries.

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Declaration of Conflicting Interests

No one has any conflict of interest.

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