

# Use of Pomegranate in Various Disease

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**Abstract:** *Pomegranate, a fruit rich in antioxidants, vitamins, and minerals, has garnered attention for its potential health benefits. This review explores the current scientific literature regarding the use of pomegranate seeds in various diseases. Studies suggest that pomegranate may positively impact heart health by reducing blood pressure and improving lipid profiles. Its anti-inflammatory properties may contribute to mitigating chronic inflammation, with potential implications for conditions such as cardiovascular disease and arthritis. Preliminary research also hints at pomegranate's role in cancer prevention, particularly in breast and prostate cancers, although further investigations are required to establish definitive links. The fruit's antimicrobial properties may offer support to the immune system, and there is emerging evidence suggesting a positive influence on diabetes management by improving insulin sensitivity. Additionally, pomegranate's potential impact on memory and cognitive function raises intriguing possibilities for neuroprotection, although more research is needed in this area. It is crucial to note that while promising, these findings necessitate further clinical trials to determine optimal doses, individual variations, and potential side effects.*

**Keywords:** Pomegranate.

## I. INTRODUCTION

Pomegranate (*Punica granatum*) is a fruit renowned for its vibrant seeds and rich nutritional profile. Widely cultivated in various regions, this fruit has long been valued for its unique taste and potential health benefits. Recent scientific interest has focused on the therapeutic properties of pomegranate seeds, exploring their potential role in mitigating various diseases. With a composition boasting antioxidants, vitamins, and minerals, pomegranate has emerged as a subject of research in cardiovascular health, anti-inflammatory effects, cancer prevention, and more. This review aims to synthesize current scientific literature on the applications of pomegranate seeds in different diseases. By delving into the findings of studies conducted thus far, we seek to provide a comprehensive overview of the potential health-promoting properties of pomegranate and its seeds. While the literature offers promising insights, it is crucial to approach these findings with caution, recognizing the need for further research to validate and refine our understanding of the therapeutic benefits of pomegranate seeds. In this context, the review will explore key areas such as heart health, anti-inflammatory effects, cancer prevention, antimicrobial properties, joint health, diabetes management, and cognitive function. As we navigate through the existing literature, the goal is to shed light on the current state of knowledge, identify gaps in understanding, and emphasize the importance of evidence-based practices. Ultimately, a nuanced comprehension of the potential benefits and limitations of pomegranate seeds will contribute to informed dietary choices and may offer insights for future research and therapeutic applications.

## PHYTOCHEMICALS IN POMEGRANATE:

**Ellagic Acid:** A polyphenol with antioxidant properties, ellagic acid is found in pomegranate and has been studied for its potential anti-cancer effects. It may help inhibit the growth of cancer cells and prevent the spread of tumors.

**Punicalagins:** These are powerful antioxidants found in the juice and peel of pomegranates. Punicalagins are responsible for a significant portion of the antioxidant activity in pomegranate and may contribute to its cardiovascular benefits.

**Anthocyanins:** Pomegranate seeds and arils contain anthocyanins, which are responsible for the fruit's vibrant red color. Anthocyanins have antioxidant and anti-inflammatory properties and may contribute to the fruit's potential cardiovascular and anti-cancer effects.

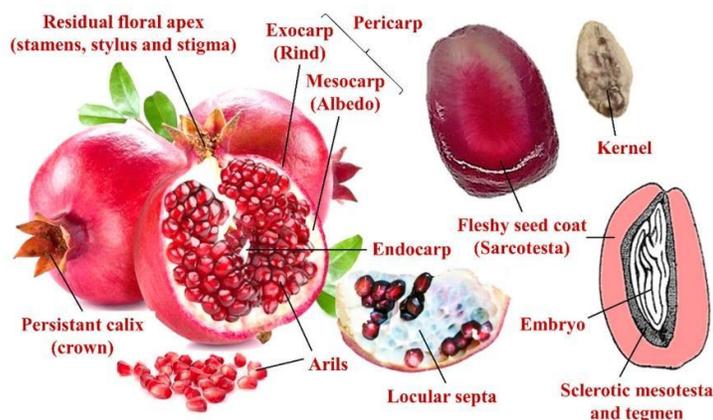
**Tannins:** Pomegranate is rich in tannins, particularly hydrolysable tannins like punicalagins and gallotannins. Tannins contribute to the astringency of the fruit and possess antioxidant and anti-inflammatory properties.

**Flavonoids:** Pomegranate contains various flavonoids, including quercetin, kaempferol, and luteolin. These compounds have antioxidant properties and may contribute to the overall health benefits of pomegranate.

**Polyphenols:** Pomegranate is a rich source of polyphenols, which have been associated with various health benefits, including anti-inflammatory and anti-cancer effects. Polyphenols contribute to the fruit's overall antioxidant capacity.

**Phytosterols:** Pomegranate seeds contain phytosterols, plant compounds with a structure similar to cholesterol. Phytosterols may have cholesterol-lowering effects and contribute to heart health.

**Vitamins:** Pomegranate is a good source of vitamins, including vitamin C, vitamin K, and some B vitamins. These vitamins play important roles in immune function, blood clotting, and overall health.



#### MONOGRAPH ON POMEGRANATE:

**Botanical Name:** *Punica granatum*

**Common Names:** Pomegranate, Granada (Spanish), Grenade (French), Anar (Hindi), Dalim or Bedana (Bengali), Roma (Italian)

**Description:** Pomegranate is a deciduous shrub or small tree belonging to the family Lythraceae. It is native to the region stretching from Iran to the Himalayas in northern India. The plant is cultivated for its vibrant and nutrient-rich fruit, which typically has a tough, leathery rind (pericarp) containing numerous juicy arils, each encapsulating a seed. The arils, seeds, and juice are commonly consumed.

**Cultural Significance:** Pomegranate has a long history of cultural and symbolic significance. It is revered in various cultures and religions, symbolizing fertility, abundance, and prosperity. The fruit is often featured in mythology, art, and religious ceremonies.

#### Nutritional Composition:

Pomegranate is valued for its rich nutritional content, including:

Antioxidants: Ellagic acid, punicalagins, anthocyanins

Vitamins: Vitamin C, vitamin K, some B vitamins

Minerals: Potassium

Dietary Fiber

Phytosterols

**Medicinal Uses:** Pomegranate has been traditionally used in various medicinal systems for its potential health benefits. Medicinal uses include: Cardiovascular Health: Studies suggest that pomegranate may help lower blood pressure, reduce cholesterol levels, and prevent atherosclerosis.

**Anti-Inflammatory Properties:** The fruit contains compounds with anti-inflammatory effects, potentially beneficial for conditions such as arthritis.

**Anti-Cancer Potential:** Some research indicates that pomegranate may have anti-cancer properties, particularly in relation to breast and prostate cancers.

**Antimicrobial Effects:** Pomegranate extracts have shown antimicrobial activity against bacteria and viruses.

**Diabetes Management:** Preliminary studies suggest a positive impact on insulin sensitivity and blood sugar regulation.

**Commercial Forms:** Pomegranate products are diverse and include fresh fruit, juice, extracts, and supplements. Pomegranate juice is a popular beverage, while extracts are used in dietary supplements and skincare products.

**Cautions:** While pomegranate is generally safe for most people when consumed in moderation, individuals on certain medications (e.g., blood pressure medications) should consult with a healthcare professional due to potential interactions. Allergic reactions are rare but possible.

#### **DRUG INTRACTION:**

**1. CYP450 Enzyme Interactions:** Pomegranate can inhibit cytochrome P450 enzymes, particularly CYP3A4 and CYP2C9. These enzymes play a key role in the metabolism of many drugs.

**Examples of Medications:** Statins (e.g., simvastatin), calcium channel blockers (e.g., felodipine), anticoagulants (e.g., warfarin), immunosuppressants (e.g., cyclosporine), some antivirals (e.g., HIV protease inhibitors).

**2. Statins (Cholesterol-Lowering Medications):** Pomegranate juice may interfere with the metabolism of statins, potentially leading to increased blood levels of these drugs. Potential Effects: Increased risk of statin-related side effects, such as muscle pain or liver abnormalities.

**3. Blood Pressure Medications (Calcium Channel Blockers):** Pomegranate juice may interact with calcium channel blockers, affecting blood pressure regulation. Potential Effects: Increased risk of hypotension (low blood pressure).

**4. Anticoagulants (Blood Thinners):** Pomegranate juice has the potential to enhance the effects of anticoagulant medications, increasing the risk of bleeding.

**Examples:** Warfarin (Coumadin), heparin.

**5. Immunosuppressants:** Pomegranate juice may affect the metabolism of immunosuppressant drugs used in organ transplantation.

**Examples:** Cyclosporine, tacrolimus.

**6. Antidepressants:** Some antidepressant medications, particularly those metabolized by CYP3A4, may interact with pomegranate.

**Examples:** Sertraline, fluoxetine.

**7. Antiviral Medications (HIV Protease Inhibitors):** Pomegranate may interact with certain antiviral medications used to treat HIV.

**Examples:** Ritonavir, saquinavir.

#### **Chemical composition**

##### **Phenolic Compounds:**

**Ellagic Acid:** A polyphenol with antioxidant properties. It may contribute to the anti-cancer effects of pomegranate.

**Punicalagins and Punicalins:** These are powerful antioxidants found in the juice and peel. They are responsible for a significant portion of the antioxidant activity in pomegranate.

**Anthocyanins:** Responsible for the red color of the arils. They have antioxidant and anti-inflammatory properties.

**Quercetin, Kaempferol, and Luteolin:** These flavonoids also contribute to the antioxidant capacity of pomegranate.

**Tannins:** Pomegranate is rich in tannins, including hydrolysable tannins like punicalagins and gallotannins. Tannins have antioxidant and anti-inflammatory properties.

**Phytosterols:** Plant compounds with a structure similar to cholesterol. Phytosterols may contribute to cholesterol-lowering effects and heart health.

##### **Vitamins:**

**Vitamin C:** An essential antioxidant that supports the immune system.

**Vitamin K:** Important for blood clotting.

Some B Vitamins: Including B5 (pantothenic acid), B2 (riboflavin), and B6 (pyridoxine).

**Minerals:** Potassium: Important for heart health and fluid balance.

**Carbohydrates:** Natural Sugars: Pomegranate contains natural sugars, primarily fructose and glucose, contributing to its sweet taste.

**Dietary Fiber:** Pomegranate seeds and arils are a good source of dietary fiber, promoting digestive health.

**Organic Acids:** Citric Acid: Adds to the tartness of the fruit.

**Malic Acid:** Contributes to the overall acidity.

**Lipids:** Pomegranate seeds contain a small amount of lipids, mainly consisting of unsaturated fatty acids.

**Water:** Pomegranate has a high water content, contributing to its juicy texture.

**Proteins:** Pomegranate seeds contain a modest amount of protein.

#### MECHANISM OF ACTION:

##### 1] Antioxidant Activity:

**Compounds:** Pomegranate is rich in antioxidants, including ellagic acid, punicalagins, anthocyanins, and vitamin C.

**Mechanism:** Antioxidants neutralize free radicals in the body, which are unstable molecules that can cause oxidative stress and damage to cells. This oxidative stress is linked to various chronic diseases, and the antioxidant activity of pomegranate may help counteract this damage.

##### 2] Anti-Inflammatory Effects:

**Compounds:** Polyphenols, including ellagic acid, and flavonoids like quercetin, contribute to pomegranate's anti-inflammatory properties.

**Mechanism:** Pomegranate may help modulate inflammatory pathways, reducing the production of inflammatory molecules. Chronic inflammation is associated with several diseases, including cardiovascular conditions and arthritis.

##### 3] Cardiovascular Health:

**Compounds:** Punicalagins, anthocyanins, and other polyphenols.

**Mechanism:** Pomegranate may have a positive impact on heart health by improving lipid profiles, reducing oxidative stress, and promoting the relaxation of blood vessels. It may also contribute to lower blood pressure and inhibit the formation of arterial plaque.

##### 4] Anti-Cancer Properties:

**Compounds:** Ellagic acid, punicalagins, and other polyphenols.

**Mechanism:** Pomegranate has been studied for its potential to inhibit the growth of cancer cells and prevent the spread of tumors. It may induce apoptosis (programmed cell death) in cancer cells and interfere with signaling pathways involved in cancer development.

##### 5] Antimicrobial Activity:

**Compounds:** Pomegranate extracts have shown antimicrobial properties against bacteria and viruses.

**Mechanism:** The antimicrobial effects may be attributed to the presence of polyphenols, which can disrupt the structure and function of microbial cells.

##### 6] Diabetes Management:

**Compounds:** Polyphenols, including ellagic acid.

**Mechanism:** Pomegranate may help improve insulin sensitivity, regulate blood sugar levels, and reduce oxidative stress associated with diabetes.

##### 7] Neuroprotective Effects:

**Compounds:** Polyphenols.

**Mechanism:** Pomegranate antioxidants may have a protective role against oxidative stress in the brain, potentially reducing the risk of neurodegenerative diseases like Alzheimer's.

#### CULTIVATION:

**Climate:** Pomegranates thrive in regions with a Mediterranean-like climate, characterized by hot, dry summers and mild, wet winters. They can also tolerate arid and subtropical climates. Pomegranates are sensitive to frost during their early years, so it's important to choose a location with minimal frost exposure.

**Soil:** Pomegranates prefer well-draining soil with a slightly acidic to alkaline pH range of 5.5 to 7.2. Sandy loam or loamy soil types are ideal. Good drainage is crucial to prevent waterlogged conditions, which can lead to root rot.

**Planting: Site Selection:** Choose a sunny location with at least 6 to 8 hours of direct sunlight per day.

**Spacing:** Plant pomegranate trees at least 12 to 15 feet apart to allow for proper air circulation and growth.

**Planting Depth:** Plant the tree at the same depth it was in the nursery container. Ensure the soil is firmly packed around the roots.

**Watering: Establishment Phase:** Water newly planted trees regularly to help them establish a strong root system.

**Mature Trees:** Once established, pomegranate trees are drought-tolerant. However, regular watering during dry periods can promote healthier growth and fruit production.

**Fertilization:** Apply a balanced fertilizer in early spring, before new growth begins. Avoid excessive nitrogen, as this can lead to vegetative growth at the expense of fruiting.

**Training:** Prune young trees to encourage a strong central leader and well-spaced scaffold branches.

**Maintenance:** Regular pruning helps maintain the shape, remove dead wood, and improve air circulation. Prune in late winter or early spring before new growth starts.

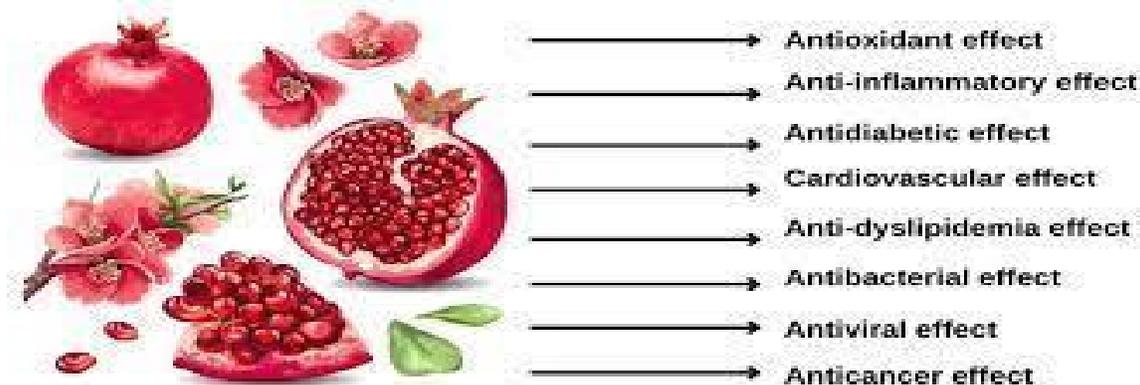
**Pests and Diseases:** Pomegranates are relatively resistant to pests and diseases, but they can be susceptible to certain issues such as aphids, scale insects, and fungal diseases. Regular monitoring and appropriate pest control measures can help mitigate these problems.

**Harvesting:** Pomegranates typically ripen in the fall. Harvest when the fruit has developed its characteristic color and makes a metallic sound when tapped. Cut the fruit from the tree, leaving a small portion of the stem attached.

**Post-Harvest Care:** Store harvested pomegranates in a cool, dry place. They can be refrigerated for extended shelf life.

**Varieties:** There are numerous pomegranate varieties, each with its unique characteristics in terms of flavor, size, and color. Popular varieties include Wonderful, Hakuho, and Eversweet.

#### USES OF POMEGRANATE IN VARIOUS DISEASES :



#### 1. ANTIOXIDANT EFFECT

Reactive oxygen species (ROS), another name for free radicals, are by products of medication metabolism, radiation exposure, and environmental pollutants. Free radicals are extremely reactive with other species and unstable due to the presence of several unpaired electrons. The body's ongoing metabolic processes frequently result in the production of ROS, which primarily target carbohydrates, lipids, proteins, and nucleic acids. Oxidative stress is defined as an imbalance between the biological system's ability to rapidly eliminate reactive intermediates or repair the resulting damage and the creation and propagation of reactive oxygen compounds (ROS). It's a chemical process that might lead to cascade reactions and free radicals that could damage the cells of an organism.

#### 2) USE POMEGRANATE IN THE RESPIRATORY MODE:

##### A] ASTHMA AND POMEGRANATES: -

Asthma is a long-term medical illness characterized by inflammation-induced narrowing, swelling, and blockage of the airways by excess mucus. Inhalers can be used to treat asthma and assist control or decrease symptoms, but their long-term usage is ultimately limited by their side effects [44, 45]. Pomegranates have been demonstrated in studies to have therapeutic use in the management of asthma. Eosinophils are associated with the occurrence of asthma exacerbations, and IL-5 is essential for the stimulation and maturing of eosinophils. The Punicagranatum, a microencapsulated leaf

extract, according to Oliveira et al., inhibited eosinophil infiltration to bronchoalveolar fluid and reduced the generation of inflammatory cytokines, such as IL-1b and IL-5, in the respiratory tract of BALB/C mice used as asthma models.

#### **B) POMEGRANATE AND COPD**

Breathing problems and airflow blockage are symptoms of persistent obstructive pulmonary disease (COPD), a respiratory illness. COPD ranks as the third most prevalent cause of mortality worldwide. Nicotine from cigarettes, domestic air pollution, and dust, fumes, and chemicals from the workplace are some of the primary causes of COPD. Considerable oxidative lung damage and neutrophil recruitment via TNF- $\alpha$  and IL-1 $\beta$  are caused by exposure to cigarette smoke. Neutrophil-secreted proteases, including caspases, neutrophil elastase, and matrix metalloproteinases (MMPs), break down the connective tissue in the lungs and induce emphysema.

#### **C) POMEGRANATE AND INFLUENZA**

A virus that infects both the upper and lower respiratory tracts is called influenza. There are several different influenza viruses that cause it. While some of these viruses are exclusive to other animals, others may infect humans. After several synthetic medications failed to cure influenza owing to side effects, several medicinal plants have been shown to be effective in treating the illness. It has been demonstrated that pomegranate has a therapeutic impact on influenza virus infections. The extract from pomegranate polyphenol juice demonstrated anti-influenza qualities by preventing the influenza A virus from replicating in Madin-Darby canine kidney cells (MDCK). Punicalagin, the polyphenol extract's most potent antiviral ingredient, was discovered to exhibit virucidal properties. Punicalagin prevented chicken RBCs from becoming agglutinated by the virus and inhibited its RNA replication.

#### **D) POMEGRANATE AND COVID-19**

The highly contagious respiratory illness known to be serious acute respiratory syndrome-coronavirus-2, or SARS-CoV-2, is brought on by a new coronavirus strain. COVID-19 Coronaviruses can cause respiratory tract infections ranging from simple colds to more serious acute respiratory distress syndrome. A key step for viral entrance and infection start is the binding of the spike (S) transmembrane glycoprotein of SARS-CoV-2 with the angiotensin-converting enzyme 2 (ACE-2) receptor on host cells [72]. One of the main goals of COVID-19 therapy was to reduce S-glycoprotein's capacity to bind to the ACE-2 receptor [73]. It has been demonstrated that pomegranate may be a viable therapy option for COVID-19. According to a recent study, pomegranate peel extract dramatically inhibited S-glycoprotein's ability to bind to the ACE-2 receptor.

#### **E) POMEGRANATE AND LUNG CANCER**

Lung cancer is the leading cause of cancer-related mortality worldwide. Lung cancer accounted for 2.2 million new cases in 2020, or 11.4% of all cancer cases globally. Numerous scientific and technical developments have improved the diagnostic process and management of lung cancer, most notably the approval of freshly developed chemotherapeutic medications that improve the long-term outlook for people with metastatic tumours. However, these medications have a number of undesirable side effects that may be avoided by substituting natural ingredients, which have long been a significant source of therapeutic agents [86,87]. Research has demonstrated that pomegranate possesses anti-cancer properties against lung cancer in both in vivo and cell culture settings.

#### **F) POMEGRANATE AND PROSTATE CANCER**

After lung cancer, cancer of the prostate is the 2nd most prevalent cause of death from cancer in males worldwide. Because it progresses slowly before symptoms appear, dietary and pharmaceutical therapies may improve patient quality of life by postponing its development. PDF Web pages and even entire websites may be quickly and simply converted to PDF with myURL. Due to its ability to stop cell development and trigger apoptosis, pomegranate fruit has been demonstrated to have potential use in the treatment of prostate cancer in humans. It results in the stimulation of pro-apoptotic molecules (Bax and Bak) and an inhibition of proteins that inhibit apoptosis (Bcl-xL and Bcl-2). Additionally, NF $\kappa$ B is inhibited by pomegranate fruit extract, which reduces NF $\kappa$ B's presence and the lifespan of prostate tumor cell lines. Fermented polyphenol-containing juice.

### **3) BREAST CANCER**

In human carcinoma of the breast cell lines, MCF-7 (a cell line acquired from a 69-year-old Caucasian woman in 1970.) and MB-MDA-231, the antiproliferative effect of fermented pomegranate juice is twice that of fresh pomegranate juice. Pomegranate seed oil also 90% inhibited MCF-7 cell growth.

### **4) CARDIOVASCULAR DISEASES**

A rich source of polyphenols with strong antioxidant potential is pomegranate juice. Furthermore, a few studies using human and murine models have demonstrated its antiatherogenic, antihypertensive, and anti-inflammatory properties. The most prevalent illness among persons receiving primary care is hypertension. It coexists with diabetes and cardiovascular disease, and most people don't usually take medication for it.

Pomegranate juice lowers systolic blood pressure and inhibits the activity of serum angiotensin-converting enzyme. In diabetic Wistar rats, an immediate subcutaneous injection of angiotensin II raises blood pressure. Administration of 100 mg/kg of pomegranate juice for four weeks has been demonstrated to lower mean arterial blood pressure. After a year, the thickness of the carotid intima-media decreased by 30% as a result of pomegranate juice intake. The main risk factor for atherosclerosis is a high plasma LDL content. Thus, oxidation, retention, and aggregation of low-density lipoproteins (LDLs) are also important factors in atherosclerosis. According to studies, drinking pomegranate juice for two weeks reduced the retention and aggregation of LDL cholesterol and raised the activity of the protective lipid enzyme serum paraoxonase. PDF Web pages and even entire websites may be quickly and simply converted to PDF with myURL. human peroxidation esterase (associated with HDL) by 20%.

### **5) ANTIMICROBIAL/FUNGAL EFFECT**

Medicinal herbs have been investigated as potential substitute agents because of the rise of bacterial resistance to antibiotic medications. Pomegranate's antibacterial qualities have received a lot of support. Pomegranate peel powder that has been dried has been demonstrated to have a strong anti-Candida effect. Furthermore, pomegranate extracts containing both methanol and dichloromethane have been shown to have antibacterial effects on the Candida genus of yeast, which is a pathogen that causes illness in immunocompromised hosts. The panta valentine leukocidin (PVL) toxin is produced by (MRSA) and (MSSA), which are resistant to numerous medications. This toxin can increase morbidity and death rates. Research suggests that pomegranate peel extract and Cu (II) ions together have stronger antibacterial activity in isolated PVL, MRSA, and MSSA. Among the most common etiological microorganisms

### **6) SKIN**

UV radiation from the sun is the main cause of numerous biological consequences, including skin cancer and photoaging. These radiations caused matrix metalloproteinases to be induced, DNA damage, and protein oxidation. Pomegranate juice, extract, and oil were tested in one research for their ability to prevent UVB-mediated damage. These compounds inhibited the UVB-induced phosphorylation of c-Jun and the quantity of c-Fos protein expression. On the other hand, applying 10 micromol/L of ellagic acid topically decreased the generation of proinflammatory cytokines such IL-1  $\beta$  and IL-6. In the connective tissue of SKH-1 hairless UVB-exposed mice, inflammatory macrophage infiltration was inhibited for a period of eight weeks.

### **7) DENTAL EFFECTS**

The preservation of the oral microbiota is linked to the bacterial coaggregations and interactions with yeasts. Pomegranate peel that has been dried and powdered is shown to exhibit a significant suppression of Candida. The antiplaque activity of pomegranate mouthwash has been documented in another investigation. Furthermore, pomegranate hydroalcoholic extract demonstrated remarkable efficacy against dental plaque bacteria, with an 84% reduction in CFU/ml.

### **8) ALZHEIMER**

According to Hartman et al.'s research [61], mice given pomegranate juice had 50% less soluble Alzheimer's disease-related plaque buildup and amyloid deposition in their hippocampal regions. This finding may have implications for treating Alzheimer's disease.

### **9) MALARIA**

Pomegranate fruit rind may have antiparasitic effects and regulate inflammation networks that cause brain malaria since it decreased the levels of MMP-9, which mRNA that hemozine or TNF generated.

### **10) HIV**

The anti-HIV-1 microbicide in pomegranate juice inhibits the major infection clades A through G and group O by preventing the virus from attaching to CD4 cells and CXCR4/CCR5.

### **11) WOUND HEALING**

When pomegranate extract and flower were used, the area of the wound was significantly reduced and the amount of fibroblasts, collagen, and inflammatory cells were increased in well-organized bands. Hydroalcoholic pomegranate extract has been shown to have properties such as increased wound percentage and the length of the protein epithelialization, collagen production periods.

### **12) ANTI-INFLAMMATORY EFFECTS: -**

The human immune system's first line of defense against external invaders and tissue injury is inflammation. There are two stages to it: acute and chronic. On the other hand, persistent inflammation can be detrimental to the body if it continues. In fact, research has demonstrated that a number of inflammatory conditions and long-term illnesses are preceded by persistent inflammation. Simultaneously, aberrant inflammatory reactions have been linked to the emergence of other non-communicable ailments, such as diabetes, obesity, insulin resistance, atherosclerosis, and disorders affecting the neurological system.

## **II. CONCLUSION**

Pomegranate is a very potent antioxidant. This fruit has anti-inflammatory, antihypertensive, and antiatherogenic properties. Among other things, it has a high concentration of flavonoids, which anthocyanins, puniceic acid substances, ellagitannins, alkaline substances, glucose, fructose, sucrose, and simple organic acids. Numerous conditions, including as rheumatoid arthritis, osteoarthritis, coronary artery disease, and some types of cancer, can be treated or prevented using pomegranate. It also has positive impacts on reproduction and enhances wound healing. The numerous soluble components and metabolites found in pomegranates have the potential to influence gene expression, which may contribute to the fruit's health benefits.

Many in vitro conditions, animal, and clinical investigations have been carried out to explore and evaluate the therapeutic advantages of these components; nevertheless, further research and trials including humans are needed to fully realize the medicinal value of pomegranates. In addition to their potential to prevent metabolic and cardiovascular disorders, pomegranates are a noteworthy source of various beneficial bioactive substances, including anti-inflammatory, antioxidant, preventing aging, prebiotic, and anti-carcinogenic characteristics. Extracts of pomegranates containing bioactive components at clinically relevant dosages of 550–650 mg/day of phenol compounds, depending on the research, can be eaten daily to achieve the aforementioned therapeutic benefits, based on the clinical trials included in this literature review (69,87). Moreover, as mentioned by Spilmont. For a person weighing 70 kg, 250 ml of juice from pomegranates is the equivalent nutritional need needed each day to be in good health. Pomegranates and their phytochemicals have the potential to act as an adjuvant, supporting and reducing the side effects of current medicines for the illnesses that have been previously treated. Further study is required to completely comprehend the complimentary effects and mechanisms of action of the phytochemicals found in pomegranates. In addition, more in vivo and in vitro studies should be carried out to improve our understanding of pomegranate's ability to prevent a wide range of degenerative disorders and support treatment strategies.

**REFERENCES**

- [1]. Cardioactive Agents from Plants: Perez Gutierrez, R. and Baez, E. MRMC 2009, 9, 878–899. [Cross Reference] [PubMed]
- [2]. Antibacterial, antifungal, and anthelmintic experiments on Ochrocarpuslongifolius were conducted by Naqvi, Khan, and Vohora in Planta Med. (1976), 29, 98–100. [Cross Reference]
- [3]. Rastogi, S., Pandey, M.M., Rawat, A.K.S. Herbal remedies: A treatment for heart conditions. In 2016, 23 Phytomedicine, 1082–1089. [Cross Reference] [PubMed]
- [4]. Bioactive qualities of commercialized pomegranate (*Punica granatum*) juice: antioxidant, antiproliferative, and enzyme inhibitory activities. Les, F.; Prieto, J.M.; Arbonés-Mainar, J.M.; Valero, M.S.; López, V. 2015; Food Funct. 6, 2049–2057. [Cross Reference]
- [5]. Guatemalan plants often used to treat dermatomucosal disorders were screened for antibacterial activity by Cáceres, A., Girón, L.M., Alvarado, S.R., and Torres, M.F. 1987, 20 J. Ethnopharmacol., 223–237. [Cross Reference]
- [6]. The natural history of progressive fibrosing interstitial lung disorders is presented by Kolb and Vašáková. 2019; Respir. Res. 20, 57. [Cross Reference]
- [7]. The Effect of Pomegranate (*Punica granatum* L.) Byproducts and Ellagitannins on the Growth of Human Gut Bacteria by Bialonska, D., Kasimsetty, S.G., Schrader, K.K., and Ferreira, D. Food Chemistry Journal, 2009, 57, 8344–8349. [Cross Reference]
- [8]. Punicagranatum's protective properties against experimentally produced stomach ulcers are reported by Alam, M.S.; Alam, M.A.; Ahmad, S.; Najmi, A.K.; Asif, M.; Jahangir, T. Methods in Toxicol. Mech. 2010, 20, 572–578. [Cross Reference] [PubMed]
- [9]. Punicalagin isolated from pomegranate husk has anti-proliferative activity and protects against oxidative DNA damage (Aqil, F., Munagala, R., Vadhanam, M.V., Kausar, H., Jeyabalan, J., Schultz, D.J., Gupta, R.C.). Food Research Int., 49 (2012), 345–353.[Cross Reference] [PubMed]
- [10]. Inhaled corticosteroids safety and adverse effects in asthmatic patients: Heffler, E.; Madeira, L.N.G.; Ferrando, M.; Puggioni, F.; Racca, F.; Malvezzi, L.; Passalacqua, G.; Canonica, G.W. 2018, 6 (776–781), J. Allergy Clin. Immunol.Pract. [Cross Reference]
- [11]. *Punica granatum*, or pomegranate, and its potential for cancer and inflammation prevention and therapy (Lanky, EP; Newman, R.A.). 2007; 109: 177–206 in J. Ethnopharmacol. [Cross Reference]
- [12]. Inflammation and Colon Cancer: Terzić, J., Grivennikov, S., Karin, E., and Karin, M. Gastroenterology 2010, 138, 2101–2114.e5. [Cross Reference]
- [13]. Kang SW, Lee YJ, Park J, Bae JY, Choi JS, and Kang YH. The dietary ingredient ellagic acid reduces UV-B-induced skin wrinkling and inflammation. (2010) Exp Dermatol 19:e182–90. [PubMed] [Scholar Google]
- [14]. Vidal A, Gra B, Rivera F, Medina ME, Peña BR, Fallarero A, et al. Research on the toxicity of whole fruit extracts from *Punica granatum* L. (Punicaceae). 2003;89:295–300 in J Ethnopharmacol. [PubMed] [Scholar Google]
- [15]. Gil MI, Hess-Pierce B, Holcroft DM, Kader AA, Tomás-Barberán FA. Pomegranate juice's antioxidant content and its connection to phenolic processing and composition. 2000;48:4581–9. J Agric Food Chem. [PubMed][Scholar Google]
- [16]. Bhadbhade SJ, Rodrigues SV, Acharya AB, Thakur SL. The effectiveness of pomegranate mouthrinse as an antiplaque.(2011) Quintessence Int. 42:29–36. [PubMed] [Scholar Google]
- [17]. J Agric Sci Technol. 2007;3:109–19. Satish S, Mohana D, Ranhavendra M, and Raveesha K. Antifungal efficacy of various plant extracts against significant seed-borne pathogens of *Aspergillus* sp. [Scholar Google]
- [18]. Kumar S, Green D, McDonnell PC, Gallagher TF, Lee JC, Laydon JT, and so on. a protein kinase that controls the production of inflammatory cytokines. 1994;372:739–46 in Nature. [PubMed] [Scholar Google]
- [19]. Kahya V, Meric A, Yazici M, Yuksel M, Midi A, Gedikli O. Pomegranate extract's antioxidant efficacy in lowering myringotomy-related acute inflammation. 2011; J Laryngol Otol. 1:370–5. [PubMed] [Scholar Google]