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NUTRITIONAL VALUE OF POMEGRANATE: A REVIEW

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ABSTRACT

From antiquity, pomegranate (*Punica granatum*) had been used for various purposes throughout the world. Pomegranate is filed of enormous medicinal and nutritional values. It is consumed fresh as well as juice. India is second to Iran for pomegranate production. In vitro as well as in vivo studies have demonstrated that pomegranate shows antioxidant, antidiabetic, antibacterial, anti-inflammatory, antiviral, anticancer and hypolipidemic activities. Cardiovascular and oral health is also improved with help of pomegranate. Current scenario of global market is demand for natural substances rather than synthetic. Pomegranate is full of nutritive and medicinal properties. In this study, we reviewed different uses of pomegranate especially the nutritional value. Pomegranate has potential for treating as well as preventive measures for various diseases.

KEYWORDS: pomegranate, nutritional value, medicinal, health benefits.

INTRODUCTION

Nowadays there is a craze and demand for food products that can help to maintain health and role that diet plays in the treatment as well preventing us from illness, ailments, diseases and disorders by consumers, researcher's and food industry also pharmaceutical industries.[1,2] At the present time, significant importance is given to the functional food. Functional food is food that enhances the health beyond basic nutrition which is provided from the food. It promotes optimal health and helps to reduce and prevent from diseased conditions. There is a effective outbreak about interest in pomegranate as a medicinal and nutritional product due to its multifunctioning property. It has several components which helps to reduce the risk of diseases. Hence it can be consumed as functional and nutritional food. As a result, the field of pomegranate research has accomplished massive growth.[3] Pomegranate is widely consumed as fresh fruit and also juice, food products such as jams and jellies and extracts to produce

herbal medicines as well dietary supplements. Biological source of pomegranate is *Punica granatum* and belonging to the family Punicaceae. Pomegranate is highly nutritive and a food which is rich in number of phytochemicals. Number of studies report that phytochemicals from the various parts of pomegranate plant such as fruit, peels, arils, juice and seeds.[4] Pomegranate is found to be vital source of bioactive components and used in medicines from the centuries.

Figure 1: Pomegranate Fruit.

Mainly the pomegranate fruit have significant antioxidant activity. In India, arils of fruit are used to make juices and beverages. Pomegranate juice possess to have a higher antioxidant activity and also effectual in preventing from atherosclerosis, low-density lipoprotein oxidation, platelet aggregation, diabetes, prostate cancer and various cardiovascular diseases.[5] The capacity of pomegranate constituents showing antioxidant activity is being proved.[6] Pomegranate has also shown antimicrobial, antibacterial, antifungal, antimutagenic and antiviral properties as well as beneficial effects on cardiovascular and oral diseases. Peels of pomegranate have shown activity of antioxidant.[7]

Chemical Constituents

Chief constituents present in different parts of pomegranate tree. Various parts such as peel, root, bark, flower, leaves which is consist of major phytochemicals.

1. Pomegranate peel: punicalin, caffeic acid, ellagitannins, luteolin, ellagic acid, gallic acid, kaempferol, quercetin and punicalagin.[9-15]
2. Pomegranate juice: Sugars, organic acids(aliphatic), gallic acid, flavonols, amino acids, minerals, quinic acid, ascorbic acid, ellagic acid and epigallocatechin gallate.[8,9,15-18]

3. Pomegranate root and bark: Ellagitannins, Pyrrolidine alkaloids, Piperidine alkaloid and Pelletierine alkaloids.[11,13]
4. Pomegranate flower: Gallic acids, Fatty acids, Triterpenoids and Ursolic acid.[20-22]
5. Pomegranate leaves: Reducing sugars, saponins, flavonoids, tannins, carbohydrates, piperidine alkaloids, glycoside, flavone and ellagitannins.[11,12,23,24]
6. Pomegranate seed: derivatives of ellagic acid, Palmitic acid, Oleic acid, Punicic acid, Stearic acid, Linoleic acid, Sex steroids, Tocopherols and Sterols.[25-30]

Majorly fruit of the pomegranate is used for various purposes. Fruit consists of number of metabolites such as organic acids, flavonoids, sugars, polyphenols, vitamins, alkaloids, fatty acids and many more. Majorly sugars extracted from pomegranate fruit are such as glucose, fructose, maltose, sucrose along with vitamins such as C, B1, B2 and β- carotene. In addition, organic acids such as fumaric acid, oxalic acid, succinic acid, citric acid, malic acid and tartaric acid. Alkaloids to be present in the peel of pomegranate are such as ellagic acid, gallic acid, cinnamic acid, hydroxy benzoic acid, chlorogenic acid, hydroxy protocatechuic acid, caffeic acid, ferulic acid, coumaric acids and its derivatives, pelletierine and its derivatives, punicalagin, punicalin, quercetin, catechin and phloridzin.[31,32] In addition, flavonoid content is also their such as luteolin and kaempferol. Glycoside naringenin is also present.[32,33] The colour of pomegranate is persuaded by its components, mainly anthocyanin. Anthocyanin is the glycoside which releases glucose molecule and glycone ring known as anthocyanidin.[34]

There are total 6 anthocyanins present which are responsible for red colour of fruit of pomegranate as such.

- Pelargonidin gives orange & red colours (3,5-diglucoside pelargonidin, and 3-glycoside pelargonidin).[34,35]
- Cyanidin gives red & deep red colours (3,5-diglucoside cyanidin, 3-glycoside cyanidin).[34,35]
- Delphinidins gives blue & purple colours (3,5-diglucoside delphinidin, 3-glycoside delphinidin).[34,35]

Nutritional Content

Table 1: Gross chemical composition (%, on dry weight basis) of pomegranate peel and seed powders.[36,37,38]

Component (%) *	Gross Chemical Component (%)	
	Pomegranate waste	
	Pomegranate peel powder	Pomegranate seed powder
Moisture	13.70	5.82
Protein	3.10	13.66
Fat	1.73	29.60
Ash	3.30	1.49
Fibre	11.22	39.36
Carbohydrate	80.50	13.12
Total phenolic	27.92	0.25

*: (%) represents the mean of triplicate determinations result.

Table 2: Amino acids composition of peel and seed powders; comparing with reference protein pattern of WHO/FAO.[38]

Amino Acids	Pomegranate Waste				FAO/WHO G/100g Protein	Amino Acid Score %	
	Peel Powder		Seed Powder				
	G/100g Sample	G/100g Protein	G/100g Sample	G/100g Protein			
+ I.A. As						Peel	Seed
Lysine	0.19	7.08	0.28	2.04	5.5	128.7	37.09
Meth + Cyst	0.09	3.35	0.54	4.68	3.5	95.7	133.7
Isoleucine	0.1	3.73	0.58	4.24	4.0	93.2	106.0
Leucine	0.19	7.08	1.08	7.90	7.0	101.1	112.8
Phen + Tyro	0.23	8.57	1.09	7.98	6.0	142.8	133.0
Valine	0.14	5.22	0.62	4.53	35.0	104.4	90.0
Total I.A. As	0.94	35.03	4.29	30.41			
++ D.A. As							
Histidine	0.22	8.20	0.46	3.36			
Aspartic	0.30	11.19	1.21	8.85			
Glutamic	0.52	19.4	3.51	25.6			
Serine	0.11	4.10	0.61	4.46			
Glycine	0.41	15.20	0.97	7.10			
Arginine	0.23	8.58	1.47	10.76			
Alanine	0.19	7.08	0.61	4.46			
Proline	0.14	5.22	0.71	5.19			
Total D.A. As	2.12	78.97	9.55	69.78			

Note: +I.A. As: Indispensable Amino Acids; ++D.A. As: Dispensable Amino Acids; Meth+ Cyst: Methionine + Cysteine (Amino Acids Containing Sulphur); Phen + Tyro: Phenylalanine + Tyrosine (Aromatic Amino Acids); Tryptophan Was Not Determined.

Table 3: Fatty acids composition of fruit seeds oil (PSO)[39,40,41]

Fatty Acids	Fatty	Acids Content (%)
Saturated	**Fatty**	**Acids**
Myristic C 14:0	-	
Palmitic C 16:0	4.2	
Stearic C18:0	3.2	
Arachidic C20:0	0.4	
Behenic C22:0	0.3	
Total Saturated Fatty Acids	8.1	
Monounsaturated Fatty Acids		
Oleic Ω-9 C18:1	6.5	
Stearoleic C18:1	0.5	
Gadoleic C20:1	0.7	
Erucic C22:1	0.9	
Total Monounsaturated Fatty Acids	8.6	
Polyunsaturated Fatty Acids		
Linoleic Ω-6 C18:2	9.4	
Punicic (9, 11, 13) All Cis C18:3	59.4	
Arachidonic W6 (3, 8, 11, 14) All Cis C 20:4	8.5	
Eicosapentaenoic C20:5	3.0	
Docosatetraenoic C22:4	1.7	
Total Polyunsaturated Fatty Acids	82.0	
Others	1.3	

Table 4: Minerals content (mg/100g dry matter) of peel & seed powders.[38]

Mineral (mg/100g)	Pomegranate waste		RDA* (mg/day)	
	Pomegranate peel powder	Pomegranate seed powder	Children	Adults
Ca	338.50	229.20	800	(800-1200)
Mg	-- 146.40	-- 434.40	80-170	280-350
K	66.43	33.03	--	--
Na P	117.90	481.10	-- 800	-- 800-1200
Fe	5.93	10.88	10	10-15
Zn	1.01	5.54	10	12-15
Mn	0.80	2.26	--	--
Cu	0.60	3.82	--	--
Se	1.03	0.23	--	--

RDA*: Recommended dietary all allowances for minerals reported by Food & Nutrition Board, (1989).

Table 5: Vitamins content (mg/100g) of peel & seed powders.[42]

Vitamins (mg/100g)	Pomegranate waste	
	Pomegranate peel powder	Pomegranate seed powder
B1 (Thiamine) B2 (Riboflavin) C (*L*-Ascorbic acid) E (α-Tocopherol) A (Retinol)	0.123 0.07 12.90 3.99 0.164	0.930 0.146 3.02 1.35 0.089

Table 6: Polyphenolic Contents Present in Fruit Peel Powder.[43-47]

Phenolic Fraction	Content (mg/100g dry matter)
Ellagic acid	44.19
Catechins	868.40
Gallic acid	125.80
Resocenol	12.50
Protocatechol	4.17
Parahydroxy benzoic acid	9.02
Phenol	242.70
Vanilline	3.91
Caffeic acid	60.46
Ferulic acid	5.89
P-coumaric acid	17.64
Others	8.20
Total	1402.88

Therapeutic Importance of Pomegranate[48]

- Vitamin C helps for blood clotting and strengthening of immune system.
- Potassium present helps to regulate the blood pressure level maintenance, muscle synthesis and conduction of nervous system.
- It has major content which reduces the cellular damage from oxidation which is known as antioxidant property.
- Pomegranate is regarded as 5th largest fruit which is rich in antioxidant content.
- It has potential to absorb the radicals which are harmful to human body.
- Improves immune system
- Prevent diabetes

Cholesterol level[48]

- It aids to block the production of cholesterol in the arteries which indirectly protects heart.
- Major antioxidants which helps are anthocyanins and tannins.
- Fruit juice helps to decrease the concentration of LDL from body which protects from

stroke attacks.

- Also leaves extract helps to reduce HDL.

Blood Pressure[48]

- Systolic BP can be decreased to considerable level with pomegranate juice.
- Potassium prevents from atherosclerosis.
- Improves blood flow which reduces heart attacks.

Memory and mood Enhancer[48]

- Flavonoids content in the pomegranate helps to improve memory and prevents from Alzheimer's disease.
- Also, antioxidants help to prevent memory loss and depression.
- Estrone present in pomegranate juice improves behaviour and mood of menopausal women.
- Prevent from mood disturbances in women.

Cancer Cells[48]

- Juice can obstruct the growth of cancerous cells in human body.
- It stops the blood flow to tumour which reduces its size and it gets destructed.

Arthritis and Joint Pain[48]

- Flavones present in the pomegranate has anti-inflammatory activity that reduces swelling of joints and collagen induced arthritis.
- COX and lipoxygenase enzymes get inhibited by seed oil of pomegranate.
- It prevents collagen deterioration and inhibits joint destruction.

Bacterial Infections[48]

- Infections like diarrhoea and ulcer can be treated by pomegranate.
- It also reduces parasitic and bacterial infection of respiratory disorders.
- Ellagic and gallic acids inhibits the lysis of cells.

Antiviral[48]

- RNA replication of influenza virus can be treated using polyphenolic extract of pomegranate which shows antiviral activity.
- Punicalagin shows inhibitory effect on RNA replication virus.

Skin Health[48]

- It helps to prevent aging and wrinkles.
- Vitamin C which is good for skin.
- Helps to remove dark circles around eyes and treats the pigmentation on face.
- Protects from skin burns and depigmentation.

Tooth loss[48]

- Plaque and loss of tooth prevents using seeds of fruit.
- Act as antimicrobial against oral bacteria.
- Gums health can be enhanced by seeds.

Pregnancy Outcomes[48]

- Protects placenta from oxidative species by anti-oxidants.
- Also contains folate in them so helps to fight against defects of birth.
- Helps in blood purification and enhances production of milk.
- Keeps urine acidic which prevents from bacterial infection
- Improves health of urinary bladder
- Enhances immunity.

CONCLUSION

Pomegranate has been studied from centuries and shows various significant therapeutic benefits both in vitro and in vivo trials. Shows significant therapeutic satisfaction in both in vitro as well as in vivo trails. In comparison with green tea is considered as best antioxidant. Each and every part of plant as like fruit, peels, arils, leaves are used in food industry as well in nutraceuticals and pharmaceuticals too for preventing and treating various diseases. It has no toxic effects to organs especially liver. If the 420mg tablet of extract of pomegranate is taken it can be used as a natural supplement. Now it's time to increase and enhance the cultivation of pomegranate by both traditional as well as non-traditional way so that the benefits can be availed in global market by export. This medicinal plant as well fruit is having potential which can bring massive progress in nutritional as well as therapeutic industry.

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