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A REVIEW ON *PUNICA GRANATUM* LINN. FLOWERS

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ABSTRACT

Punica granatum Linn. Flowers commonly known as 'Gulnar Farsi ' is distributed throughout India and is mostly cultivated almost on all type of soil but preferably on deep loamy soil. The flower possesses Antipyretic, Antidiarrhoeal, Styptic, Haemeostatic, Astringent, Antiemetic, Desiccant, Anti ulcers, and Anthelminthic properties and is used traditionally as an important remedial agent for haemoptysis, bronchitis, dyspepsia, vomiting, diarrhoea, dysentery, intestinal worms, haematemesis, intestinal ulceration, rectal bleeding, hemorrhoids, menorrhagia, leucorrhoea, uterine ulceration, and in bleeding gums. Medicinally, it has been proven to possess various pharmacological activities like Analgesic, Cardioprotective, Wound healing, Antioxidant, Nephroprotective, Antidiabetic, Spasmolytic, Antihistaminic activity and Inhibitory effect on tumor necrosis factor-α (TNF-α). Further, studies reveal the presence of various phytochemical constituents mainly steroids, reducing sugars, triterpenoids, sugars, alkaloids, phenolic compounds, flavonoids, catechins, saponins, tannins, anthroquinons and amino acids. These studies reveal that *Punica granatum* is a source of medicinally active compounds and have various pharmacological effects; hence, it is encouraging to find its new therapeutic uses.

INTRODUCTION

Gulnar Farsi (*Punica granatum* Linn.) is the male abortive flower of wild rumman plant which belongs to the family Punicacae/Lytheraceae.[1,2,3,4,5] It is described in Unani literature as Julnar which is derived from the Persian word Gulnar while some writers mentioned it as Gulnar, Hazara, Inhaftyana, Falustoon[6,7,8] Julnar [9,8,10] Qamarrumman, Zehraturrumman, Janbadurrumman.[11]

Though the entire plant has medicinal value however, its flowers and rind are more commonly used as therapeutic agents for diverse pathological conditions. Since the Persian variety is supposed to be superior so it is more famous. The flowers of this species are large in size and red, pink, white, and black in colour. The flowers are astringent and hence used medicinally.[6,8, 9,10,11,12,13]

Botanical Description

Gulnar Farsi plant is large deciduous shrub or small tree, considered to be the native of Asia, Iran, Afghanistan, Arabia and Baluchistan, found growing wild salt range warm valley and outer hill of Himalayas and cultivated throughout India almost on all type of soil but preferably on deep loamy soil 14,1(Anonymous, 1987; Anonymous, 2003). Flowers are 3.8-5cm. long mostly solitary some times 2-4 together, terminating shorts shoots, sometimes apparently axillary or sessile calyx-tube companulate, adnate to and produced beyond the ovary, coriaceous, lobes 5-7 valvate petals 5-7,ovate scarlet, wrinkled, inserted between the calyx lobes. Stamens are very numerous and inserted on the calyx below anthers elliptic, dehiscing longitudinally. Ovary inferior, manycelled, style long, bent, stigma capitate.[1,4,15,16]

Morphology

The flowers are bell shaped and beautiful in colour due to presence of several whorls of petals and are 1.5-3.0 cm high, 1.5-2.5 cm broad. The calyx is bell shaped generally with shallow thalamus and it is up to 2.0 cm long and 1.2 cm in girth. The colour is nasturtium orange pale near the lobes and the lobes are 5-7 in number and ovoid in shape and conspicuously a gland tipped. Three lobes are up to 10 mm long and other are 3-4 mm long. Outer colour is deep orange, and inner colour is light orange. The calyx encloses an adense crumpled mass of petals almost looking like an asteraceae head. The corolla is indefinite in number, spirally arranged in calyx cup, deep vermillion in colour. The petals are actually modified stamens. The petals in the outermost whorls are larger in size and their size reduces towards the periphery. The shape and size of each petal is very variable some of the smaller

petals are like stamens having log stalk and smaller fringed petal lobes at the tips, while some other petals are having very small stalk and large fir shaped petal lobes. The length of petal varies from 7-12 mm. and breath from 2-8 mm. The petals are not clawed.[4,14]

Period of occurrence

Practically throughout the year but especially during February to May and September to October. [14]

Procedure and time of collection

The fully opened flowers are collected in April-May and September-October. The flowers are dried in shade for several days. Drying can be done in oven at 35 ^{0}C -40 ^{0}C.[14]

Vernaculars[4,15,16,17,18]

Gulnar Farsi (flowers of *Punica granatum* Linn.) is known by different names in different parts of world including the Indian subcontinent.

Language/Region	**Nomenclature**
Hindi	Anardana
Bengali	Dalimb
Gujrati	Dalamb, Dadamb
Kannada	Dalimbari
Kashmiri	Daan
Malayalam	Mathalanarakam
Marathi	Dalimb
Oriya	Dalimba
Panjabi	Anardana
Sanskirt	Dadima-Phalam
Tamil	Mathalam Pazham
Telgu	Danimma Pandu
Urdu	Anar
Assamese	Dalim
Persian	Gulnar
Arabic	Julnar, Rumman
Unani	Baloositrun
English	Pomegranate

Taxonomical Classification[19]

Kingdom	Planatae
Subkingdom	Tracheobionta – Vascular plants
Superdivision	Spermatophyta – Seed plants
Division	Magnoliophyta – Flowering plants
Class	Magnoliopsida-Dicotyledons
Subclass	Rosidae
Order	Myrtales
Family	Puniaceae
Genus	*Punica*
Species	*granatum*

Phytochemical studies of *Punica granatum* Linn.

Britto and Gracelin (2011) reported the presence of steroids, reducing sugars, triterpenoids, sugars, alkaloids, phenolic compounds, flavonoids, catechins, saponins, tannins, anthroquinons and amino acids in the methanol extracts of flowers.[20]

Rena *et al*. (2009) investigated ten compounds viz: gallic acid (1), methyl gallate (2), ellagic acid (3), (+) catechin (4), isoquerecitrin (5), D-mannitol (6), ursolic acid (7), Oleanolic acid (8), beta-Sitosterol (9) and Daucosterol (10).[21]

Ali and Sharma (2006) determined the polyphenol compound from *Punica granatum* Linn. flower by thin layer chromatography (T.L.C) over silica gel and reported four new constituents namely, punicanyl benzoate (4'-hydroxy non-6'-en-yl benzoate),granatumol (13-(15,19,19-trimethylcyclohex-16-en)-yl-6,10-dimethyl-tridec-10-en-3beta, 4beta,6alfa,13beta-tetrol) punicaflavone (3,7,8,4'-tetrahydroxy-3'-myrt-8-en-yl flavone), grantumoside (beta-gluco-pyranosyl-(1-4')-b-glucopyranosyl-(1'-4")-b-glucopyranosyl-(1-4"')-b 6'''methoxyglucopyranosyl(1-4''')-rhamnopyranose).[22]

Wang *et al.* (2006) have reported the presence of a new polyphenol compound namely pomegranatate, together with, ellagic acid, 3,3′,4′-tri-O-methylellagic acid, ethyl brevifolincarboxylate, urolic , maslinic acids and daucosterol that were isolated from the ethanolic extract of the flowers of *Punica granatum* Linn. flowers by column chromatography on silica gel.[23]

Bagri *et al.* (2009) reported the presence of two sterol esters: beta sitostero laurate and beta-sitosterol myristate from *Punica granatum* flowers.[24]

Pharmacological Actions

In Unani system of medicine, the whole plant of Gulnar Farsi (rind, flower, leave, fruits, and bark) is used as medicine in various forms such as decoction, powder, tablet etc. for different pharmacological effects. The flowers are used by Unani physicians as *qabiz*, *habis*, *mujaffif*, *jazib* etc. The important therapeutic uses are :

In the form of powder it is effective in cough, haemoptysis, bronchitis, tuberculosis[15,25,26] The juice of flowers is effective in sore throat.[16]

Its powder and decoction are effective in dyspepsia, vomiting, diarrhoea, dysentery, intestinal worms, haematemesis, intestinal ulceration, rectal prolapse, rectal bleeding, haemorrhoids and intestinal colic etc.[7,11,15,16,25,26]

It is used in menorrhagia, leucorrhoea, uterine ulceration, and uterine prolapse in the form of decoction, douches, syringing and sitz bath.[7,10,11,15,16,25,26]

Gulnar Farsi is used in uretheritis, urethral ulceration and in increased frequency of micturition (diuresis) due to "Diabetes" and other causes. It is used in Diabetes and other diseases of kidney. [6,10,26]

It is used in various inflammatory conditions. The flowers and honey are mixed in the form of paste and used in conjunctivitis and keratitis.[7,11,15,16,25,26]

It is effective in gingivitis, toothache, bad smell and bleeding gum in the form of tooth powder, paste and gargle.[15,16,25]A paste prepared with its flower and vinegar is used in wounds and ulcers.[11]

The juice of flowers and juice of *Cydon dactylon* equal part is given to stop the nasal bleeding[1,14,16]

Concentrated extract with honey is used in chronic nasal wounds.[26]

Phytochemical studies

Punica granatum has been shown to possess Analgesic , Cardioprotective, Wound healing activity, Antiulcerogenic, Antioxident, Nephroprotective, Antidiabetic, Spasmolytic effects, Antihistaminic activity and have Inhibitory effect on TNF-α.

Analgesic activity

Chakraborthy (2008) studied the extracts of flowers *Punica granatum* Linn. for analgesic activity in mice using 'hot plate' method and reaction time of animals in all the groups was noted at 30, 60 and 120 min after drug administration. The various extracts of the flowers

showed significant analgesic activity at a dose of 50 mg/kg body weight and the maximum analgesic activity was found at 60 min, after drug administration.[27]

Sarker *et al.* (2012) reported that Pet-ether, dichloromethane and methanol fractions of flowers of *Punica granatum* Linn. possessed analgesic and anti-inflammatory activities in animal model of Carageenin induced rat paw oedema. The analgesic effect was measured in mice using the acetic acid-induced writhing test. In the acetic acid-induced writhing test in mice, pet-ether, dichloromethane and methanol fractions at 200 mg/kg doses level showed inhibition of writhing. In rat paw oedema model induced by Carageenin, pet-ether, dichloromethane and methanol fractions were found to reduce oedema at 100 mg/kg dose.[28]

Cardioprotective activity

Khatib *et al.* (2011) investigated the effect of aqueous extract of *Punica granatum* Linn. flowers against isoproterenol induced MI in rats by subcutaneous injection of isoproterenol (150 mg /kg.b.w) at the interval of 24 hrs for 2 days. The isoproterenol treated rats showed significant increase in cardiac markers such as lactate dehydrogenase (LDH), Cretinine kinase (CKMB), Alanine aminotranseferase (ALT), aspirate aminotransferase (AST) in serum and altered the pattern in E.C.G. which were found to be reduced significantly after the treatment with *Punica granatum*.[29]

Wound healing activity

Pirabalouti *et al*. (2010) evaluated the wound healing activity at of diethyl ether extract of *Malva sylvestris* and *Punica granatum* Linn. flowers at 200 mg /kg /day in Alloxan-induced diabetic rats. The efficacy of treatment was evaluated based on wound area relative and histopathological characteristics. The extract treated diabetic animals showed significant reduction in the wound area when compared with control and histological studies of the tissue obtained on day 9^{th} and 18^{th}. Well organized bands of collagen, more fibroblasts and few inflammatory cells were seen in the extract treated animals.[30]

Antiulcerogenic activity

Zoobi and Mohd. (2011) investigated the antiulcerogenic activity of alcoholic extract of *Punica granatum* Linn. flowers against Aspirin and Alcohol induced ulcers. 24 hrs. pre-treatment P.O. with alcoholic extract of *Punica granatum Linn.* flowers (500 mg /kg) induced protection against alcohol induced ulcer. The alcoholic extract of *Punica granatum Linn.* flowers induced 63.23% inhibition in ethanol induced lesion in gastric mucosa whereas water soluble fraction exhibited 84.70% inhibition. The alcoholic extract flowers presented the

54.5% of inhibition of the Aspirin induced gastric lesion and water soluble and water insoluble fractions of the extract showed the significant reduction of Aspirin induced Carageenin gastric ulcer which was 86.07%and 48.78%, respectively.[31]

Antioxident property

Cambay *et al*. (2011) reported the *Punica granatum* Linn. flower improves learning and memory performances impaired by Diabetes Mellitus in rat. These antioxidant ability of flowers to cope with the oxidative stress. Rats were divided into five groups with 12 animals in each group as given below: control, Diabetes (STZ), STZ + PGF I (300 mg/kg/day), STZ + PGF II (400 mg/kg/day) and STZ + PGF III (500 mg/kg/day). The STZ group had impairments in learning and memory performances compared to the control group but PGF led to improvements in learning and memory performances of diabetic rats, while lipid peroxidation (LPO) was increased; glutathione (GSH) content was decreased in hippocampal tissue of STZ-induced diabetic rats when compared with control values. Supplementation of PGF restored the levels of LPO and GSH towards their control values. Daily PGF supplementation to diabetic rats reduced the increase in glial-fibrilar acidic protein (GFAP) contents induced by Diabetes in the hippocampus, which was significant in STZ + PGF III in comparison to STZ group. In conclusion, these observations suggest that PGF supplementation decreases oxidative stress and ameliorates impairment in learning and memory performances in diabetic rats. Therefore, it is suggested that PGF supplementation may be clinically useful in treating neuronal deficit in diabetic patients.[32]

Nephroprotective activity

Singh *et al*. (2011) has reported the nephroprotective activity of *Punica granatum* Linn. flower. Pretreatment with hydroalcoholic extract of flowers of *P. granatum* (125 and 250 mg/kg p.o. twice daily for 3 days) significantly attenuated hypertonic glycerol-induced renal dysfunction in a dose-dependent manner. BADGE (Bisphenol-A-diglycidyl ether) (30 mg/kg), a peroxisome proliferator-activated receptor (PPAR)-γ antagonist, and N (omega)-nitro-l-arginine-methyl ester (L-NAME) (10, 20, and 40 mg/kg), nitric oxide synthase inhibitor, were employed to explore the mechanism of renoprotective effects of *Punica granatum* Linn.Administration of BADGE (30 mg/kg) and L-NAME (40 mg/kg) abolished the beneficial effects of *P. granatum* in glycerol-induced renal dysfunction.[33]

Antidiabetic activity

Huang *et al.* (2005) described that the antidiabetic activity of PGF extract may result from improved sensitivity of the insulin receptor. From the in vitro studies, they demonstrated that the PGF extract enhanced PPAR-γ and protein expression and increased PPAR-γ-dependent mRNA expression and activity of lipoprotein lipase in human THP-1-differentiated macrophage cells. Phytochemical investigation demonstrated that gallic acid in PGF extract is mostly responsible for this activity. Thus, findings indicated that PPAR-γ is a molecular target for PGF extract and its prominent component gallic acid, and provide a better understanding of the potential mechanism of the antidiabetic action of PGF.[34]

Jafri *et al.* (2000) described that Gulnar Farsi, the male abortive flowers of *Punica granatum* Linn. are used for the treatment of Diabetes Mellitus in Unani medicine. Oral administration of its aqueous-ethanol (50%, v/v) extract led to significant blood glucose lowering effect in normal, glucose-fed hyperglycaemic and Alloxan-induced diabetic rats. This effect of the extract was maximum at 400 mg/kg. [35]

Iqbal *et al.* (2011) reported that *Punica granatum* Linn. flowers extract possessed hypoglycaemic and hypocholesterolemic effect in experimentally induced hyperglycaemia and hypercholestomia by Alloxan in experimental animals.[36]

Bagri *et al.* (2009) investigated the effect of *Punica granatum* Linn. aqueous extract (PgAq) on Streptozotocin (STZ) induced diabetic rats by measuring fasting blood glucose, lipid profiles (atherogenic index), lipid peroxidation (LPO) and activities of both non-enzymatic and enzymatic antioxidants and reported a significant effect possessed by *Punica granatum*.[37]

Spasmolytic effects

Ahangarpour *et al.* (2012) studied that aqueous and hydroalcoholic extracts of *Punica granatum* Linn. flower could induce spasmolytic effects on uterine muscle contractions caused by KCl, barium chloride or oxytocin. The highest dose of both extracts had the highest antispasmodic effect on uterine contractions.[38]

Antihistaminic activity

Barwal *et al.* (2009) stated that various extracts of *Punica granatum* Linn. flower buds showed antihistaminic activity in clonidine-induced catalepsy and haloperidol-induced catalepsy in Swiss albino mice at the dose of 50 and 100 mg/kg, P.O. The ethanol and aqueous extract inhibited clonidine-induced catalepsy and not inhibited haloperidol-induced catalepsy. The cataleptic effect of clonidine in the mouse is mediated by histamine release from mast cells and the clonidine-induced catalepsy was inhibited by ethanol extract is

probably due to their mast cell-stabilizing property and the plant does not have activity on dopaminergic transmission. Thus, it can be concluded that tannins from the flower buds of *Punica granatum* Linn. may be responsible for antihistaminic activity and may have potential role in the treatment of asthma.[39]

Inhibitory effect on TNF

Xie *et al.* (2008) have demonstrated that methanolic extract from the flowers of *Punica granatum* Linn. produced the inhibitory effect on tumor necrosis factor-α (TNF-α) induced cytotoxicity in L929 cells.[40]

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