



Ethnomedicinal use and pharmacological potential of *Punica granatum* L. in Uzbekistan

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Notes on Ethnobotany

Abstract

Background: This study synthesizes ethnobotanical knowledge on the economically valuable species *Punica granatum* and emphasizes its potential applications in natural pharmaceuticals and nutraceuticals.

Methods: The assessment of the distribution ranges of *Punica granatum* was carried out using the route-reconnaissance method widely applied in resource surveys. Field observations were conducted across all mountain regions of the Surkhandarya Province of Uzbekistan. Ethnobotanical data were collected through questionnaire surveys conducted during interviews with the local population. The survey was carried out with the informed consent of the respondents. The interviews were conducted in accordance with the International Society of Ethnobiology Code of Ethics (ISE Code of Ethics, 2006).

Results: *Punica granatum* is widely recognized for its ethnomedicinal applications. Its juice supports immune function, alleviates sore throat, regulates blood pressure, and provides cardioprotective effects. Dried peel, seeds, and seed membranes are used to treat gastrointestinal disorders, skin injuries, headaches, and nervous tension. These traditional uses underscore the potential of *P. granatum* for the development of natural medicines and nutraceuticals.

Conclusions: Ethnobotanical studies focused on the investigation of the valuable food and medicinal plant *Punica granatum* L. in its natural habitats in the mountainous regions of the Surkhandarya Province of Uzbekistan have shown that wild-growing forms, which are closely related to cultivated pomegranate, served as the primary source material for the development of numerous cultivated varieties differing in their organoleptic properties. In addition, various plant parts of pomegranate are widely used in traditional medicine, cosmetology, textile dyeing, and other applied fields.

Keywords: *Punica granatum*, pomegranate, wild relatives, ethnobotany, Red data book, Uzbekistan.

Background

Punica granatum L. belongs to the family Lythraceae and comprises two species: the cultivated pomegranate (*P. granatum* L.) and the wild pomegranate (*P. protopunica* Balf.f.) (<https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:25518-1>). A tree or shrub, 1,5-5 m high, glabrous, with opposite branches and spinescent branchlets; leaves opposite or alternate-fascicled, oblong, oblong-lanceolate or lanceolate, 2-8 cm long, subobtusate, sometimes cuspidate, coriaceous, entire, lustrous, deciduous; flowers profuse, 2-4,5 cm in diameter; calyx reddish, coriaceous, 1-2 cm long, thickish, broadly triangular lobes 5-7 mm long; petals obovate, bright red, 3,5-5 cm long; fruit large, spherical, to 10 cm in diameter, bright red, less often greenish or white; ripe fruit sometimes persistent on branches, splitting and exposing succulent seeds through longitudinal fissures; seeds numerous, angular, 8-14 mm long, 5-8 mm broad. Flowering May-August; fruiting: end of September (Vvedensky *et al.* 1969).

Growing wild on dry, gritty slopes in the semi steppe foothill zone, sometimes on taluses. In the Caucasus (Grossgeim, 1962) on shore pebbles and on sandy soils. Widely distributed in cultivation in the southern Central Asia, in Crimea, and in the Caucasus. -Caucasus: E., W. and S. Transc. Dag.; Central Asia: Mtn. Turkmenistan (Dashtidzhum area), Pamir-Alai. (Mountains of Tajikistan, Darvaz, Dashtidzhum area, Uzbekistan, Surkhandarya) (Shishkin *et al.* 1949).

Punica granatum fruits contain 25-32% sugars, 0.2-2.5% organic acids, 10% tannins, up to 3.4% proteins, 2-6% pectin, as well as iron, cobalt, iodine, and vitamins C, P, and A. The vitamin C content in the fruit's ranges from 250 to 1300 mg; it is also present in the leaves, roots, and flowers. Depending on the acidity of the juice, pomegranates are conventionally classified into three groups: sweet (acidity up to 0.9%), sweet – sour (0.9-1.8%), and sour (above 1.8%) (Namozov, 2021). Pomegranate peel contains significant amounts of polyphenolic compounds such as hydrolysable tannins (punicalin, punicalagin, ellagic acid, and gallic acid), flavonoids (anthocyanins and catechins), and other substances that contribute to the high antioxidant activity of pomegranate peel (Saparbekova *et al.* 2022). Pomegranate arils consist of 35.02% water, 1.54% ash, 6.85% fat, 12.64% starch, 9.38% protein, and 22.41% fiber. The seeds contain 6.6% water, 20.8% fat, 20% starch, 34% fiber, and 10% nitrogenous substances. Fresh pomegranate peel contains 56.16% water, 39.2% ash (dry matter), and 28.38% nutrients. The pericarp, roots and bark contain up to 32% tannins (Sokolov, 1987).

As a result of intensive human economic activity, including the development of new territories and unregulated fruit harvesting, this species has been included in the Red Data Book of the Republic of Uzbekistan with status 3 – a rare species whose population is declining and requires conservation measures (Khasanov, 2019).

Modern cultivated forms of pomegranate (*Punica granatum* L.) have been developed through long-term selection of their wild ancestral forms. For many years, Uzbekistan has been actively engaged in the establishment of pomegranate plantations and the introduction of promising cultivars. According to sectoral studies, more than 25% of all pomegranate plantations in the CIS countries are concentrated in Uzbekistan. Pomegranate fruits are characterized by considerable variability in size, with an average fruit weight ranging from 150-200 g to 1.0-1.2 kg. At present, more than 40 pomegranate cultivars are cultivated in the country. Depending on the cultivar and the age of plantations, yield levels range from 15 to 35 t/ha (Namozov, 2021).

Materials and Methods

Distribution and Mapping

The mountainous regions of the Surkhandarya Province in Uzbekistan are characterized by rich plant biodiversity. The uniqueness of the local flora is attributed to a high concentration of endemic and relict species, making the region an important center for scientific research. Among the economically valuable species are *Astragalus babatagi* Popov, *Berginia hissarica* Boriss., *Ferula tadshikorum* Pimenov, *Ficus carica* L., *Punica granatum* L., and *Vitis vinifera* L. (Zakirova *et al.* 2025; Khasanov *et al.* 2019; Khojimatov *et al.* 2020).

The studies were carried out primarily under field conditions using the route-reconnaissance method during the 2025–2026 seasons, supplemented by the examination of herbarium specimens deposited in the National Herbarium of Uzbekistan (TASH: TASH00579832, TASH5710121, TASH5710123). The results demonstrate that under the environmental conditions of Uzbekistan, wild populations of *Punica granatum* L. occur within the Surxondaryo Region, specifically on the Kohitang (Kugitangtau) Range, the southern slopes of the Gissar Range, and in the Topalang (Tupalang) Gorge.

In Uzbekistan, *Punica granatum* L. occurs in the wild in the Surkhandarya Region, including the Kugitangtau Ridge, the southern slopes of the Hissar Range, and the Tupalang Gorge. In the Sariosiyo District, the species has been recorded in Turmushobod mahalla (Kunday-Juvoz village; 38.641617° N, 67.833014° E) at an altitude of 1697 m a.s.l., as well as in the vicinity of Kshtut village (38.844507° N, 67.965437° E) at an altitude of 2400 m a.s.l. (Fig.1)

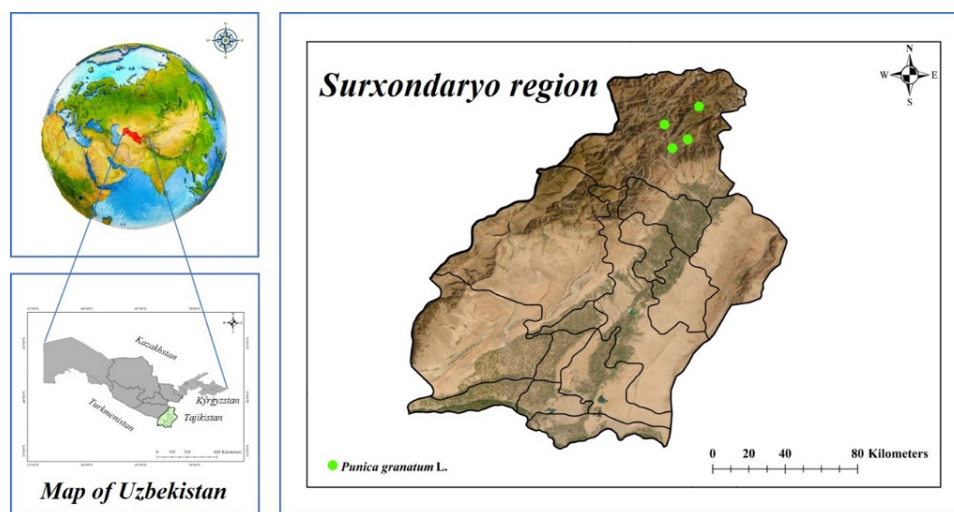


Figure 1. Map of Surkhandarya Province of Uzbekistan - research site.

In the study area, *Punica granatum* primarily inhabits dry, shallow, gravelly-stony slopes, frequently occurring on scree or beneath rocks. Individuals are mostly scattered, with small, monospecific stands occasionally forming in favorable microsites. The species grows in association with a range of herbaceous taxa, including *Aegilops triuncialis* L., *Bromus danthoniae* Trin., *Gentiana olivieri* Griseb., *Hordeum bulbosum* L., *Poa bulbosa* L., and *Prangos pabularia* Lindl., reflecting a xerophilous, open-slope plant community. Populations are generally low in density, indicating patchy distribution influenced by microtopography and soil conditions.

Ethnobotanical Studies

Ethnobotanical data were collected through interviews with traditional healers, herbal traders, and local residents of the mountainous regions of the Surkhandarya and Kashkadarya Provinces (Fig.2. a, b; Fig.3. a, b). All interviews were conducted after obtaining oral informed consent from the participants. The study was carried out in accordance with the Code of Ethics of the International Society of Ethnobiology (ISE 2006). Information was recorded on the traditional medicinal uses of the plant, recommended dosages, methods of preparation, and the plant organs utilized in folk medicine.

Results and Discussion

Data on the ethnobotanical and domestic utilization of *Punica granatum* for various economic purposes and traditional medicine were obtained through voluntary structured questionnaires and semi-structured interviews with socially active local residents representing diverse professional backgrounds. The survey targeted primarily individuals over 45–50 years of age, involving a total of 53 respondents (18 females and 35 males). The informants were residents of the Surxondaryia, Qashqadariya, Samarqand, and Jizzakh regions, as well as the city of Tashkent.

Since ancient times, pomegranate (*Punica granatum*) has been recognized as a valuable food and medicinal plant. It was widely used in traditional medicine and is mentioned in the works of Hippocrates and Avicenna. The fruits, stems, root bark, and fruit peel of pomegranate have long been used as medicinal raw materials in traditional medical systems for the treatment of various diseases. In folk medicine, crushed pomegranate roots mixed with aloe juice have been traditionally applied as an analgesic remedy in cases of bone fractures (Namrata Ankush Giri et al. 2023).

Decoctions prepared from pomegranate flowers and fruit peel have been traditionally used to manage diarrhea; steam baths prepared from the flowers are reported to promote wound healing, while root infusions have been applied in the treatment of ulcerative conditions (Sakhobiddinov, 1948). Abu Ali ibn Sina (Avicenna) documented the use of pomegranate for bleeding, diseases of the mammary glands, gastrointestinal disorders (including diarrhea and dysentery), enhancement of urination, wound treatment, and other pathological conditions.



Figure 2. Wild growing *Punica granatum* in Tupalang region of Surkhandarya. a - general view of the plant, b - fruits.



Figure 3. a - Cultivated pomegranate from Surkhandarya. «Desertniy» pomegranate cultivar, b. - Cultivated pomegranate from Kashkadarya, «Kzyl» pomegranate cultivar

In traditional practice, pomegranate ash mixed with clarified butter or animal fat has been applied topically to treat skin fissures. Decoctions of the fruit peel have been used for rinsing the oral cavity in inflammatory conditions, and in some cases, pomegranate peel has been given to young children during teething. Avicenna also recommended the use of flower buds and leaves to control bleeding, treat throat diseases and dysentery, and reduce fever.

In medieval European medicine, pomegranate juice was employed as a sedative agent, while the fruit peel was used as a gargle. Pomegranate juice, rich in vitamins and biologically active compounds, has been widely valued as a therapeutic and preventive agent and has traditionally been recommended in cases of physical exhaustion, anemia, atherosclerosis, respiratory tract infections, bronchial asthma, tonsillitis, and exposure to ionizing radiation. It has been reported to exhibit choleric, analgesic, anti-inflammatory, and antiseptic properties, as well as antipyretic and thirst-quenching effects (Marra et al. 2022).

Pomegranate juice is traditionally combined with carrot and beet juices, particularly during pregnancy. Juice sweetened with sugar has been used to improve blood circulation. The therapeutic potential of pomegranate juice is partially attributed to its relatively high manganese content, which plays an essential role in the activity of various enzymes.

According to modern phytotherapeutic practice, consumption of half a pomegranate fruit three times daily is recommended for colds, acute and chronic colitis, and diarrhea. Fresh or preserved pomegranate juice has been traditionally used in cases of cardiac arrhythmia, ascites, atherosclerosis, radiation-related disorders, and toxic hepatitis, as well as to stimulate appetite and bile secretion. In cases of edema, intake 20 minutes before meals, three to four times daily, has been advised.

Pomegranate juice has also been traditionally used in the management of kidney diseases, urolithiasis, gallbladder disorders, hypertension, and palpitations. Pomegranate sugar syrup has been regarded as a hematopoietic agent. Decoctions of the fruit peel and flowers have been applied as antiseptics for gargling, while decoctions of ripe fruits and flowers have been used as hemostatic agents. An alcoholic extract of the peel in an aqueous glycerin solution has been reported to accelerate wound healing when applied topically.

The peoples of the Caucasus and Central Asia have traditionally used pomegranate fruits in the treatment of ulcers, malaria, and digestive system disorders, including diseases of the kidneys and liver. In Uzbekistan and Tajikistan, certain pomegranate cultivars are traditionally used to manage colds and cough. Dried pomegranate flowers, consumed as herbal tea, are reported to be beneficial for individuals with hypertension. Fresh leaf bark and roots are taken internally as an anthelmintic. Juice from sour varieties is used to stimulate appetite and manage fevers. An ointment made from the ash of pomegranate bark mixed with butter is applied to treat pustular skin conditions. *Punica granatum* is consumed both fresh and in processed forms, including jams (Paniagua-Zambrana *et al.* 2025).

From the dried peel, a powder is prepared that possesses astringent properties and is beneficial for treating enterocolitis, skin injuries (such as scratches, abrasions, and cracks), and dental issues. A decoction made from pomegranate peel is traditionally used to alleviate colds and as a remedy against intestinal parasites. Additionally, dried and powdered seeds can help relieve headaches, lower blood pressure, and regulate hormonal balance (Khojimatov *et al.* 2023; Khojimatov *et al.* 2024).

The thin white membrane separating the seeds from the peel also exhibits valuable medicinal properties. When dried and prepared as a decoction or infusion, it is particularly recommended for individuals experiencing nervous tension, as it can calm the nervous system and promote healthy sleep. Dried membranes can also be added to conventional tea, enhancing its therapeutic effects (Khojimatov *et al.* 2020; Tayjanov *et al.* 2021).

Owing to its diverse chemical composition and the presence of biologically active compounds, pomegranate is widely utilized in medical and cosmetic applications.

Below are the most popular traditional medicine recipes for the treatment of various diseases (<https://ethnobotany.uz/plant/punica-granatum-l-2/>)

Sore throat and stomatitis

Dry pomegranate crusts (20 g) pour 200 ml of water and boil over low heat for 30 minutes. Strain, bring to the original volume with boiled water. Rinse the throat and mouth 5-6 times a day.

Treatment of paronychia (periungual panarium)

Ingredients: 10 g of pomegranate crust powder and dried figs. Grind figs with pomegranate peel powder and apply to an inflamed surface, bandage. For maximum effectiveness of the composition, you need to change the bandage every 5 hours.

Hypotension

Brew 1 cup boiling water 1 tbsp. a spoonful of dry pomegranate leaves, insist for 15 minutes, strain and drink 2 times a day, 150 ml.

Dysentery in children

Pour boiling water over the chopped fresh peel of pomegranate fruits (5 g per 100 ml), boil for 10 minutes, strain. Give children 1-2 teaspoons 3 times a day.

Colitis

Grind one pomegranate fruit together with the peel and seeds into gruel. Eat during the day in 3-4 doses.

Indigestion

Pour boiling water over fresh pomegranate crusts (50 g per 200 ml) and boil over low heat for 30 minutes. Strain, bring to the initial volume with boiled water and drink 1/2-1 cup 3 times a day.

Burns

Quickly fill the burn site with pomegranate juice. Then apply a dressing dipped in juice.

Pinworms

Pour dry pomegranate crusts with boiling water (10 g per 200 ml) and insist on a water bath for 30 minutes. Strain and drink 1/3 cup 2-3 times a day for a week.

Skin irritation

Wash down 10 fresh pomegranate flowers with 1 cup boiling water, insist for 30 minutes. In a warm infusion, moisten a cotton swab and apply to inflamed skin, apply compress paper and make a warm bandage. After 20 minutes, remove the compress.

Freckle remedy

Cut the pomegranate in half and squeeze out the juice. Immediately wipe the skin covered with freckles with it. With oily skin, after 10 minutes, wash with pomegranate juice diluted with boiled water 1:5.

Vitamin tea

Ingredients: 10 fresh pomegranate flowers, 400 ml of boiling water, 1-2 teaspoons of granulated sugar. Pour boiling water over the pomegranate flowers, insist for 10 minutes, adding granulated sugar. Cool to room temperature and drink at high temperature 1-2 glasses per day.

Multivitamin juice

Ingredients: 400 ml pomegranate juice, 700 ml carrot juice, 500 ml green salad juice. Mix freshly squeezed juices and drink throughout the day. Other formulations may be made in a similar manner, for example with beet juice.

Pomegranate fruits are utilized in the confectionery industry and traditional medicine. The bark, branches, and roots of the plant contain significant amounts of nutrients and coloring compounds (up to 32%), which have allowed their application in dyeing fabrics, including wool and cotton, as well as in ink production. The fruit peel has been used for dyeing wool and linen and preparing paints and inks, while pomegranate flowers have traditionally served as a source of red dyes for textiles and writing inks. Bright red pigments for both light and dark shades can be obtained from the fruits.

Fruits and peel of pomegranate are also processed to obtain dietary supplements and citric acid, which is employed in the leather industry for tanning purposes. The wood of pomegranate is considered a durable construction material, and the plant is additionally cultivated for ornamental purposes. Thin shoots of the plant have been traditionally used for weaving sturdy baskets.

In addition to its economic and medicinal importance, *Punica granatum* holds a prominent cultural role in Uzbekistan and is regarded as the national fruit. Symbolically, it represents abundance and prosperity, fertility and lineage continuation, vitality and health, spirituality, and social unity. The numerous seeds within a single fruit signify wealth and family well-being, while the closely packed seeds serve as a metaphor for cohesion or enduring marital bonds. Traditionally, pomegranate is associated with fertility, and pomegranate-shaped earrings are gifted to daughters as a symbol of a strong and harmonious family. In Islamic tradition, it is considered a “fruit of paradise,” symbolizing spiritual pleasure and joy.

In Uzbekistan, the female names Anora and Gulnora, derived from the image of the pomegranate (Anor), are widely used in anthroponymy. In Uzbek cultural tradition, the pomegranate flower is associated with beauty, femininity, vital energy, and harmony, and also serves as a symbol of fertility and renewal. These names reflect the close relationship between Uzbek anthroponymy, plant symbolism, and ethnocultural concepts of life, well-being, and the continuation of the family line.

The stylized pomegranate motif (Anorgul) is a widespread element in Uzbek applied arts, appearing in hand embroidery (Suzanne), painting on Rishton ceramics, wood carving, carpets, engraved metalwork, and jewelry (Fig.4. a, b, c, d, e, f).



a

b



c



d

Figure 4. Cultural role of pomegranate in Uzbekistan. a, b, c - silk fabrics with pomegranate pattern; d - traditional bride decoration (Markets in the Fergana Region); e, f – pottery (Markets in the Surkhandarya and Kashkadarya Regions)



e f
Figure 4. Cultural role of pomegranate in Uzbekistan. a, b, c - silk fabrics with pomegranate pattern; d - traditional bride decoration (Markets in the Fergana Region); e, f – pottery (Markets in the Surkhandarya and Kashkadarya Regions)

Conclusion

Further in-depth studies of the beneficial properties of pomegranate stimulate scientists from various disciplines and industrial technologists to develop new natural products based on different parts of this plant. One of the key objectives of such research is the rational and integrated use of plant raw materials aimed at enhancing their biological value and expanding the scope of practical applications. To ensure the conservation of this red-listed species, young saplings and cuttings were introduced in 2025 to the experimental plot for medicinal and other raw material plants at the Laboratory of Introduction and Agroecology of Raw Material Plants of the Tashkent Botanical Garden named after Academician F.N. Rusanov, under the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan. Collected herbarium specimens and fruits of wild *Punica granatum* have enriched the institutional collection and are deposited in the herbarium of the aforementioned laboratory. The implementation of this measure contributes both to the ex-situ conservation of the species and to the enrichment of the Tashkent Botanical Garden's collection with this valuable plant genetic resource.

Declarations

Ethics approval and consent to participate: All participants involved in the interview process gave their prior informed oral consent.

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