Socio-economic appraisal of the importance and impacts of Anardana (*Punica granatum* L.) in District Dir Lower Khyber Pakhtunkhwa, Pakistan

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Research

Abstract

Background: Present survey was conducted to explore the status, socio-economic importance and impact of Anardana (*Punica granatum* L.) by the inhabitants of Dir, lower Khyber Pakhtunkhwa, Pakistan.

Method: Different techniques like semi-structured, open-ended questionnaires and interviews, a field survey, and group discussions were undertaken in Dir lower to understand socio-economic relevance and influence on local peoples. The data was assessed using various ethnobotanical indicators such as the relative frequency citation (RFC), usage value (UV percent), and fidelity level (FL).

Results: Quantitative indices revealed that the plant is mostly used for the treatment of urinary problems, stomach disease and dry cough. Furthermore, the RFC results show that the plant is frequently used for fuel (1.00), fruit (0.97), medicine (0.93), spices (0.89) and fencing (0.88) purposes. Moreover, the results declared that *P. granatum* is mostly used (UV %) as a remedy for dry cough (90.5%), stomach disorders (81 %), urinary troubles (79.5%), diuretic (72%), renal calculus (66.5%), and fever tonic (62.5%). Out of 52 ailments, 16 ailments were identified with greater FL than 50 %. However, the highest ICF values were recorded for the dry cough (0.95) disease category, which shows that the disease is common in the community. The study naked that most informants agreed to *P. granatum* as a tonic for fever and dry cough, revealed the highest fidelity level (100 %) in the study area.

Conclusions: Documentation of such ethnobotanical data will help conserve *P. granatum,* create awareness among the local community, and preserve the indigenous knowledge of medicinal plant species.

Keywords: *Punica granatum,* traditional knowledge, quantitative ethnobotany

Background

People living in rural regions widely depend on traditional knowledge of medicinal plants to cure a wide range of diseases. Food, shelter, fodder, medicines, and timber are all provided by plants, which also recycle water and prevent soil erosion. Plants also control atmospheric gases, recycle water, and keep soils stable (Abbas *et al.* 2020). Many developing nations rely heavily on medical plants and plant-based medicines (Asase & Kadera 2014, Kpodar *et al.* 2015, Giday *et al.* 2017). Around 80% of the world's population receives health care from herbal remedies in rural regions in underdeveloped nations (Adeniyi *et al.* 2018, Hao & Xiao 2020, Jan et al. 2020, Wagh & Jain 2020).

According to the international community, many ethnic communities depend on natural resources, particularly medicinal plants (Gulzar *et al.* 2019, Umair *et al.* 2017; Mahomoodally *et al.* 2018). In recent decades, qualitative survey approaches for investigating medicinal plants have grown increasingly (Ong & Kim 2014, Kayani *et al.* 2014, Ahmad *et al.* 2017).

Several kinds of ethno botanical research have been conducted in various parts of Khyber Pakhtunkhwa (Ahmad *et al.* 2021). However, applying statistical tools to explain these correlations is not sound. Quantitative ethnobotanical approaches are the best way to determine the current state of the medicinal flora of a region (Siraj & Khan 2021). Conservation strategies may be planned using plant resource research data (Ullah *et al.* 2020). In order to conserve and cultivate these species, various government and non-government agencies need to conduct multiple ex-situ and in-situ initiatives. Questionnaires and Participatory rural appraisal (PRA) are the most reliable methods for gathering public opinion on forest conservation plans to understand better such environmental concerns (White *et al.* 2005). However, it is important to note that questionnaires may be classified as either closed or open-ended, depending on the research goals. It is also common to gather data and administer surveys by mail, phone, internet, social media, and in-person interviews. The questionnaire might lead to an incorrect interpretation of the subject's real behavior (White *et al.* 2005).

The Himalayan region, which encompasses Afghanistan, Bhutan, Bangladesh, China, Nepal, India, Myanmar, and Pakistan, is well-known for its abundance of medicinal plants (Rashid *et al.* 2018, Shinwari & Qaisar 2011, Hussain *et al.* 2012). Recently, the United States, France, Italy, China and Japan have been considered the most dominant medicinal plant industry. Some nations in Asia gather medicinal plants in their traditional practices, but only a few countries, such as India, China, and Nepal, can commercially produce the herbs. Among the Asian countries, Pakistan is considered the seventh-largest producer of medicinal herbs (Khan et *al.* 2015, Kanwal & Sherazi 2017). Around 600 species are utilized as traditional medicine in Pakistan, and therapeutic herbs are used by more than 75 % of the population for all or most of their healthcare needs. Medicinal flora is widely used in pharmaceuticals, food, cosmetics, and dietary supplements (Petrakoua *et al.* 2020). Most indigenous peoples still depend on plant-based treatments (Farooq *et al.* 2019, Hussain *et al.* 2018). Herbal therapies have a long history of use in East Asia (Kangl *et al.* 2020) and are thought to be safe and effective, with few adverse effects (Malik *et al.* 2019).

Punica granatum locally referred to as "Anardana" is a medicinally important wild tree in the northern region of Khyber Pakhtunkhwa Pakistan (Mushtaq & Gangoo 2017). This plant is actually a deciduous shrub or small tree that grows from 5 to 8 metres (16 to 26 feet) tall and bears fruit year-round. 'Anardana', a commercial product used primarily in medicinal and culinary preparations, is made from the fruits' seeds, which are sundried. Harvesting of ripe fruits begins in August and continues until October (Dhandar & Singh 2002). With the help of a long stick, the fruits are usually hand pluck with bending the branches. The rest of the stock is sold after some product has been used for self-supply. The chutney made with the anardana (mint, green chillies, sugar) is believed to relieve summer heat and aid in digestion as well as treating stomachache and constipation. As well as being used for cooking and baking, pomegranates can also be blended into juices and smoothies and used in alcoholic beverages such as wine and cocktails (Singh & Sethi 2003). In order to conserve and cultivate these species, various government and non-government agencies need to conduct multiple ex-situ and in-situ initiatives. It will also promote the economic development of the region and help preserve these valuable medicinal resources. Phytochemical studies may highlight their true value so that they can be managed and conserved for the benefit of indigenous communities as well as the welfare of mankind as a whole through systematic documentation of Anardana knowledge and traditional herbal knowledge.

In this research, *Punica granatum* L. (Wild) socio-economic and ethnomedicinal values were evaluated for the following objectives:

➢   how widespread is the socio-economic and ethnomedicinal information about the species?
➢   In terms of conservation, what are the prospects for biodiversity in District Dir (L)?
➢   To assess the status and potential of Anandana (*Punica granatum*) in fostering better livelihoods for rural communities.

Material and Methods
Study area
The District Dir lower of Khyber Pakhtunkhwa, Pakistan, was selected as the sampling location for this research (Fig 1). Dir Lower is located 124 kilometers from Peshawar and encompasses an area of 1,582 Km^2 of the Hindukush

Mountains spinning between 35 ° 50' N latitude and 71 ° 2' E longitude (Khan *et al.* 2010, Ahmad *et al.* 2015). The district's elevation ranges from 1200 m to 2800 m above sea level, and the climate varies according to elevation (Khan *et al.* 2010). Summers are hot and humid, while the winters are chilly, with maximum temperatures of 34.6 C in the summer and a minimum of 13.4 C, with an average annual rainfall of 13.4 millimeters (Ullah 2020). Local communities employ a wide range of medicinal and fragrant plants found in the study area (Ali *et al.* 2019).
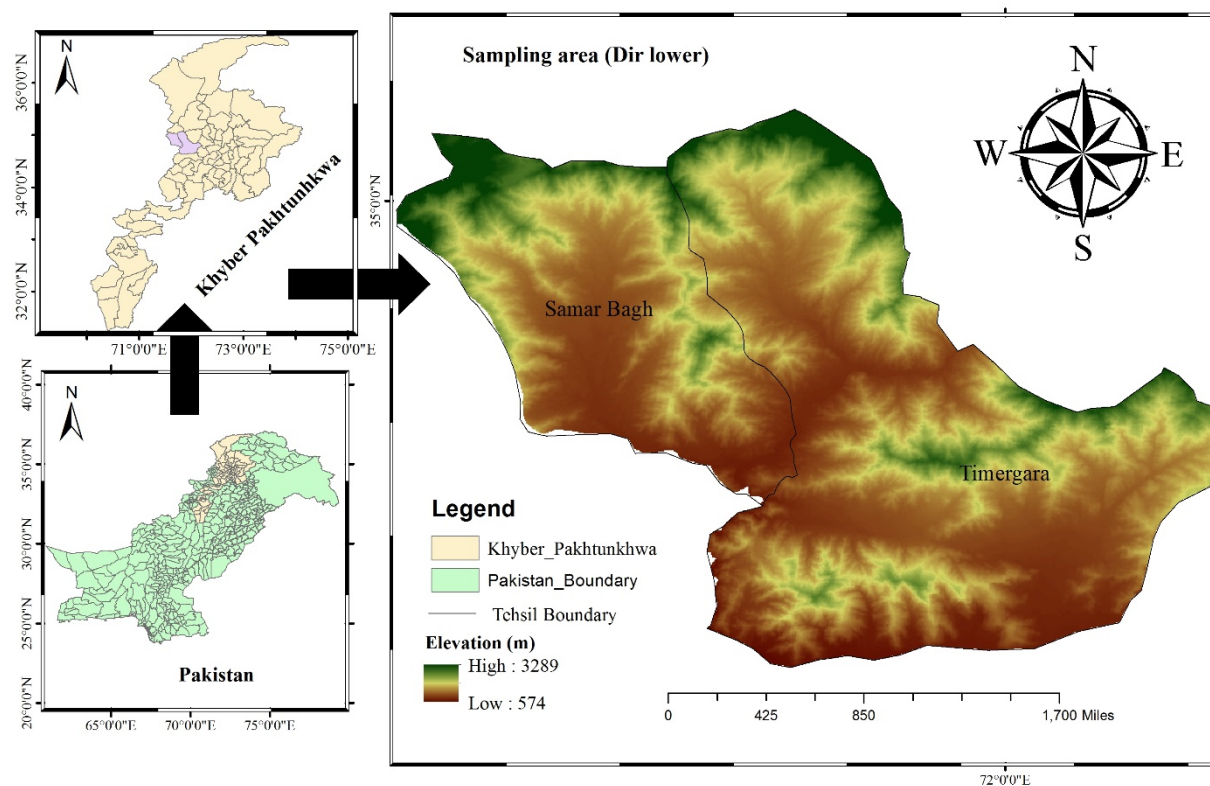

Figure 1. Study area map representing the location of the studied plant

Socio-economic data collection

Semi-structured interviews and participatory rural appraisal (PRA) were utilized to collect socio-economic data on the relevance and impact of the research region (Ahmad et al. 2021). In the instance of PRA, the essential information was gathered by methodically selecting Peasant Associations (PA) and Dhera town. A purposeful selection of important informants was made from the PA and Dhera town. Respondents for a semi-structured interview were chosen randomly from a pool of potential candidates. For the PRA, a random sample of 20 people was chosen at random from the general community. A semi-structured interview was conducted with 50 participants, 20 of whom were women.

Household Survey

More than 200 respondents were questioned in the research region where *Punica granatum* L. (Wild) woods predominate simultaneously using a simple random sample approach (Huda 2013). Each participant was selected by lottery following Huda (2013) instructions, utilizing voter lists obtained from the district election commission office as a starting point. This process ensures that each candidate has the same chance of being picked equally. Consequently, a semi-structured interview/Questionnaire (SSIQ), following Ali *et al.* (2017), was applied to obtain socio-economic, ecological, ethnomedicinal and ethno-demographic information from the population residing in the neighborhood forest. Using a purposive selection strategy, twenty-four important data points were picked from the population.

Data Analysis

SPSS (version 16) was used to analyze the questionnaire data. Participants' socio-demographic characteristics, education level, perceptual knowledge of *P. granatum* L. and participant information on these forests' usage, management, and conservation were analyzed using descriptive statistics. Socio-demographic factors and other pertinent fundamental information were grouped by frequency and percentiles.

The Relative Frequency of Citation (RFC) index examined the socio-economic and ecological utilization of *P. granatum* and allied species obtained in the research area. According to Ahmad *et al.* (2017), the following formula calculated the Relative Frequency Citation index.

$$RFC = \frac{FC}{N} \ (1)$$

Where FC= the number of respondents citing a species and N= the sum of the respondents from the area. Zero indicates no one thought the plant was beneficial, whereas one indicates that everyone thought the plant was useful (Sadeghi & Kuhestani 2014).

The relative significance of local plant species was determined by calculating usage value (UV) (Kayani *et al.* 2014). The following formula used to calculate it,

$$UV = \frac{\Sigma Ur}{N} \ (2)$$

Where Ur = The number of uses mentioned by each respondent for a given species and N = The total number of respondents.

It is used to determine the percentage of informants claim to have used a certain plant for the same principal purpose and is determined by using the following formula.

$$FL = \frac{Np}{N} \times 100 \ (3)$$

Where Np = number of informants who cited the species for a particular disease N = total number of informants who cited the species to treat any disease.
The informant consensus factor (ICF) was calculated to judge the agreement of the informants for *punica* species in treating a specific disease (Heinrich et al. 1998) using formula

$$ICF = Nuc - Ns/Ns - 1 \ (4)$$

Where Nuc used for number of use citation in each used category and Ns is number species used in each category.

The covariance of two variables, when divided by the product of their standard deviations, is a quantitative measure of their association, and the Pearson correlation is one such measure. SPSS version 16.0 was used to calculate the distance between RFC and UV (Semenya *et al.* 2012, Rawat *et al.* 2008).

Results

Demographic characteristics of the respondents
A total of 200 people, ranging in age from 25 to 80 years, were surveyed. Only 21.5 % of the responders were female, while 78.5 % were men. A large section of the interviewed population (71%) was married and were from the Malizai ethnicity. The majority of the population (69 %) had some formal education, while about 31 % were illiterate. Respondents with a primary education comprised only 19.5% of the population; however, most of the people who answered the survey (28.5%) went to a secondary or higher school level, and 22 % earned a higher degree, which shows that the people in the area are more likely educated (Table 1). More than half of the people (70 %), who took the survey, were farmers, 7.5 % were housewives, and 24.5% worked for the government and non-profits. Students or businesspeople made up just 14.5 % of the total population at the event. Most individuals who participated in the poll possess at least 5 acres of property, yet almost half earn less than Rs. 10,000 PK every month.

P. granatum forests were cited as having four primary benefits by residents:social, economic, ecological, and ethnomedicine. Results from table (2) display the descriptive data gathered from the informants concerning these foundational advantages. The findings revealed that the local respondent attained the greatest social advantages ranking 1st, followed by ecological (2nd), economic (3rd), and ethnomedicinal (4th) (Table 2). According to respondents, *P. granatum* land covers should be managed properly to conserve it for future generations.

Table 1. Age categories versus the level of education of the respondents.

Demographic feature	Number of informants	Percentage %
Age		
Above 60	50	25%
51-60	41	20.5%
41-50	42	21 %
31-40	34	17 %
Less than 30	33	16.5 %
Gender		
Men	157	78.5%
Women	43	21.5%
Education		
Uneducated	60	30 %
Elementary	39	19.5%
High school	57	28.5%
Above high school	44	22%
Occupation		
Farmers	70	35%
Hakeem's	37	18.5%
Students and professors	29	14.5%
Housewives	15	7.5 %
Laborers and others	49	24.5%

Table 2. Benefits obtained from the *Punica granatum* forests in District Dir Lower.

Benefit obtained	Respondents (n)	Percentage	Ranking
Social importance	180	93 %	1st
Ecological importance	178	92 %	2nd
Economic importance	160	86.6 %	3rd
Ethno-Medicinal importance	121	67.33 %	4th
Total	200	100%	

Most of the older respondents knew a lot about the various plants of the forest, including their local names and the significance of each one. The respondents said that *P. granatum* L. was surrounded by a dense forest of broad-leaved species for a long time. These woods, however, were reduced to a patchwork look as a result of widespread deforestation and unrestrained timber harvesting. The majority of those polled agreed that the benefits of *P. granatum* L. dominated and associated with broad-leaved tree species, such as the availability of woody tree species, environmental balance and windbreak by vegetation, control of soil erosion and growth of grasses for various purposes, health-friendly environment, and eco-tourism, outweighed the negative impacts, such as the restriction of domestic animals from accessing forests and crops. In general, 94% of the 200 participants had a good attitude toward these woods. In comparison, only 6% of the respondents felt that the enclosure and management of these forests would leave them landless, making them unable to participate in conservation efforts.

The occupants of these woodlands have reaped various ecological advantages (Ranking 2nd), including the re-emergence of various wild creatures and the restoration and stability of the study area. Of the respondents, 88% (182) view that climate and rain patterns in the region are unstable and influenced by these woods. As a result of the recent drought, many tree and shrub species have been seriously harmed. It's fascinating to observe that the locals were aware of the connection between forests and climate change. Drought killed most of them.

For these woods to survive, urgent safeguards against widespread abuse by locals are required. Disturbance, land balding, and deforestation result from building and road projects in these woodlands. It should be discouraged to address these issues and conceal these gullies by vegetation regeneration. When faced with these situations, residents were convinced that maintaining and reforesting the region was critical since their lives depended on the forest's supplies. According to survey results, these woods are of second-order ecological significance. Respondents strongly advocate for their restoration so that the next generation can appreciate the value of forests like these.

According to the group discussion findings, the locals prioritize preserving and restoring the forest's vegetation. Under the approval of the District Forest Officer, they may also gather *Punica* fruits and grasses for house cover or feeding cattle during the dry season without incurring any extra fees (Fig 2). According to the survey, 95% of respondents, including local experts such as foresters and agriculturists, had to travel long distances and pay high prices because there were no proper rules for house roof cover, livestock feed, or fruit collection. Chapli Kabab's flavor is enhanced by using fresh and dried fruits in spices (condiments), especially Anardana (Fig 3).

Figure 2. Resident collecting fruits from *P. granatum* trees covered with fruits

Respondents emphasized that the forest's long-term advantage can only be realized if administered through government-community collaboration. According to the norms and regulations set by the people and the government forest department office in Dir Lower, the owner of a domestic animal found in these woods must pay a fine of Rs. 500 PKR for each animal. Furthermore, the locals tend to take what their community members and elders say seriously, demonstrating the need to integrate such informed individuals in future awareness

Figure 3. Anardana is prepared from *P. granatum* fruits supplied to the local market.

The feedback from local inhabitants indicated that they utilize the therapeutic herbs from these woodlands customary. Use value (Uv) and fidelity level (FL) of each ailment of the species are calculated from the available information. Tables 3 revealed detailed usage percentages for each medical purpose of the plant species. *P. granatum* was found to be often used for dry cough (90.5%), a stomach disorder (81 %), urinary troubles (79.5%), diuretic (72%), renal calculus (66.5%), and a fever tonic (62.5%), according to the present research work. Another 58 % of people take it for dysentery, while the rest use it as an anthelmintic, digestive aid, blood purifier, laxative, or a cooling agent or laxative, all of which account for less than 26 % of the total (Table 3). *P. granatum* is an important medicinal plant species because of its comprehensive therapeutic benefits. FL level for all diseases in the study area ranges from 7 % to 100 %. Out of 52 ailments, 16 ailments were identified with greater FL than 50 %.

P. granatum were found to treat different ailments of human and other livestock. Informant consensus factors (ICF) values for 52 ailment categories were shown in Table 3.

Table 3. Quantitative analysis of the ethnomedicinal uses of *Punica granatum* L in different ailments.

S. No	Medicinal Uses	∑ur	Use Value (UV)	% UV	FL %	ICF	S. No	Medicinal Uses	∑ur	Use Value (UV)	% UV	FL %	ICF
1	Dry Cough	181	0.905	90.5	100	0.95	27	Strengthening the gums	46	0.23	23	25	0.54
2	Stomach diseases	162	0.81	81	86	0.94	28	Cardiotonic	43	0.215	21.5	14	0.54
3	Urinary troubles	159	0.795	79.5	39	0.92	29	Relieve Burns	42	0.21	21	51	0.95
4	Diuretic	144	0.72	72	83	0.95	30	Expectorant	41	0.205	20.5	21	0.80
5	Renal calculus	133	0.665	66.5	43	0.95	31	Hyperdipsia	39	0.195	19.5	31	0.88
6	Tonic for fever	125	0.625	62.5	100	0.95	32	Pectoral diseases	38	0.19	19	29	0.82
7	Dysentery	116	0.58	58	89	0.90	33	Piles	35	0.175	17.5	17	0.95
8	Diabetes	112	0.56	56	80	0.90	34	Leukorrhea	35	0.175	17.5	43	0.45
9	Anthelmintic	104	0.52	52	50	0.87	35	Jaundice	34	0.17	17	10	0.42
10	Epistaxis	93	0.465	46.5	86	0.87	36	Anemia	32	0.16	16	19	0.67
11	Hepatopathy	92	0.46	46	75	0.83	37	Pharyngotympanic	31	0.155	15.5	13	0.66
12	Digestion	89	0.445	44.5	85	0.84	38	Astringent	31	0.155	15.5	14	0.33
13	Appetizer	88	0.44	44	25	0.73	39	Sexual vigor	31	0.155	15.5	26	0.55
14	Ascariasis	78	0.39	39	29	0.53	40	Oliguria	30	0.15	15	35	0.20
15	Prevent Vomiting	78	0.39	39	21	0.81	41	Gastralgia	29	0.145	14.5	15	0.76
16	Tonic	74	0.37	37	59	0.80	42	Spermatorrhea	26	0.13	13	25	0.15
17	Diarrhea	73	0.365	36.5	19	0.54	43	Prolapse of rectum	21	0.105	10.5	29	0.25
18	Bronchitis	72	0.36	36	53	0.71	44	Irregular menses	18	0.09	9	12	0.88
19	Bleeding nose	66	0.33	33	38	071	45	Skin rashes	16	0.08	8	17	0.80
20	Blood purifier	64	0.32	32	12	0.54	46	Medical soap	15	0.075	7.5	25	0.45
21	Tonsillitis	63	0.315	31.5	17	0.75	47	Taeniasis	15	0.075	7.5	27	0.25
22	Cooling agent	55	0.275	27.5	25	0.75	48	Tinea	14	0.07	7	11	0.34
23	Aphrodisiac	54	0.27	27	27	0.71	49	Ophthalmodynia	14	0.07	7	8	0.27
24	Pain killer	54	0.27	27	68	0.72	50	Splenopathy	8	0.04	4	13	0.15
25	Laxative	52	0.26	26	53	1	51	Otalgia	6	0.03	3	10	0.32
26	For improving Vision	51	0.255	25.5	58	1	52	Scabies	5	0.025	2.5	7	0.32

More than seventeen different disease categories were recorded highest values by respondents in the study area. Dry Cough, Stomach diseases, Urinary troubles, Diuretic, Renal calculus, Tonic for fever Dysentery and Diabetes have the highest ICF value (each greater than 0.90), followed by other diseases (more than 0.80). Highest ICF values greater than 0.7 indicated that diseases are common in the community.

These four advantages of *Punica Granatum* were rated on top according to the relative frequency cited (RFC) (Table 4). As can be seen from the RFC score for *Punica granatum*, this plant is most commonly used as fuelwood (RFC = 1.00), fruit (0.97), medicine (0.99), and spice (0.89), and a fencing material (RFC = 0.88).

Table 4. The Relative Frequency of Citation (RFC) scores for socio-economic and ecological uses of *Punica granatum*.

Description of Uses	FC	N	RFC	RFC %	Rank
Agriculture Tool	163	200	0.815	81.5	2
Constriction material	126	200	0.63	63	8
Dye	63	200	0.315	31.5	11
Fencing	132	200	0.66	66	6
Fodder	131	200	0.655	65.5	7
Fruit	145	200	0.725	72.5	4
Fuel	150	200	0.75	75	3
Medicine	179	200	0.895	89.5	1
Ornamental	121	200	0.605	60.5	9
Soil Conservation	66	200	0.33	33	10
Spices	134	200	0.67	67	5

In ethnobotanical research on the therapeutic benefits of *P. granatum*, it was found that the plant has a variety of everyday uses for a broad range of common disorders such as scabies and cholera. A plant portion of the whole plant might be employed alone or in conjunction with other plant elements or minerals to improve its effectiveness and efficiency. The powdered fruit peel is used to speed wound healing, as a purgative, and for indigestion relief. Astringents, refrigerants, laxatives, and blood cleaners can all be found in fruits. The dried seeds are used as a spice and flavoring. Antihelmintic, antipyretic, and expectorant mouthwashes include root and stem bark. Traditional medicine makes use of the plant as well. Leaves, fruit, fruit peel, and seeds were the most common plant parts used by the indigenous populace of Khyber Pakhtunkhwa for various ailments. Fruit skin (32 %) was the most commonly used plant part in the production of medicine, followed by seeds (22 %) and flower (20 %), whole plant (9 %), shoot (7 %), root bark (6 %), seed and root bark (6 %), and whole plant (9 %) (each 2 %) (Fig 4).
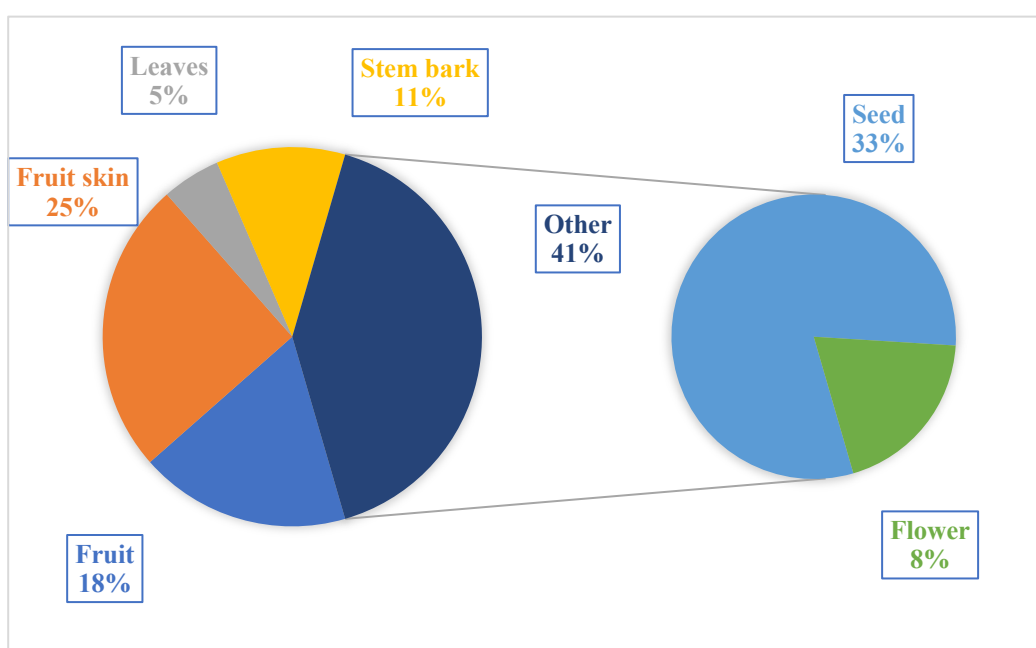

Figure 4. Percentage (%) of *Punica granatum* parts used for different diseases.

One-eighth of those polled reported using it for dry cough, one-seventeenth reported using it to relieve urine irritation, one-seventeenth reported using it to treat stomach disease, and one-tenth reported using it to treat diarrhea. One-tenth reported using it to purify the blood. Other reported uses included treating bone pain, chest pain, skin irritation, dysentery, Diabetes, and anthelmintic. Dysentery and skin issues are treated using an extract made from fresh leaves. Powdered seeds are made by drying and grinding seeds.

Pearson correlation coefficient
RFC was inversely linked to the number of times local informants mentioned using certain plant species (Fig. 5).
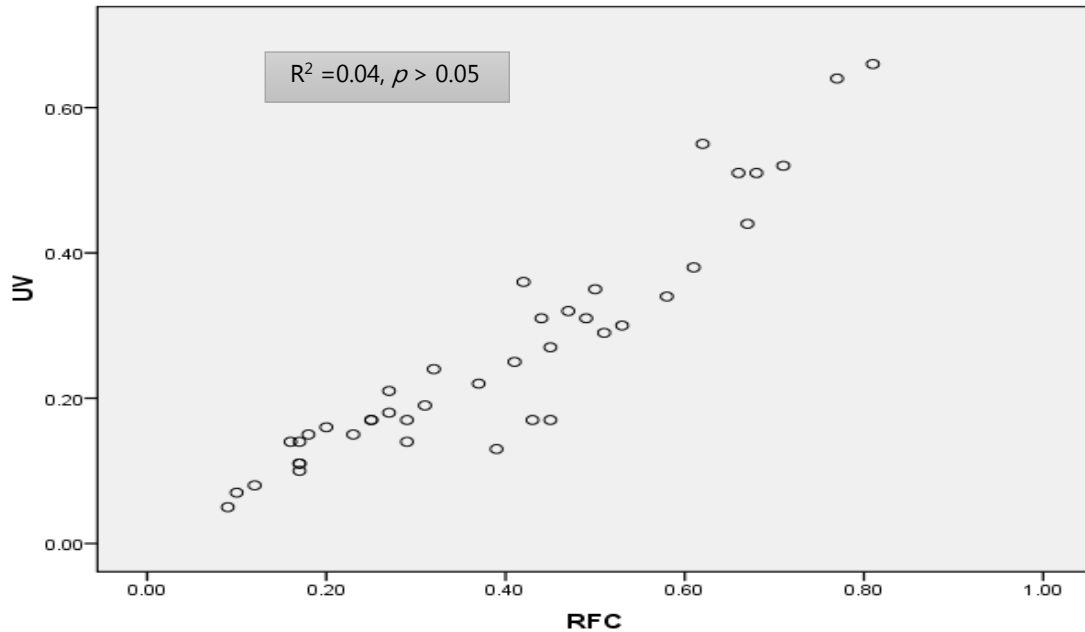

Figure 5. Association between RFC and UV shows a strong Pearson correlation coefficient.

In other words, as the number of people who know about a plant grows, so does its usefulness. According to the research results, a single plant might treat many illnesses. These results are in line with what we learned through RFC research. The substantial Pearson correlation value between RFC and UV indicated that their patterns coincide, regardless of sickness. r^2 was used to calculate the Correlation between RFC and UV. R^2 ($R^2 = 0.04$, $p > 0.05$) was used to calculate the Correlation between RFC and UV, which shows a significant positive correlation to treat various diseases.

Table 5. Strong positive Correlation between UV and RFC of *Calotropis procera*.

		RFC	UV
RFC	Pearson Correlation	1	.936[**]
	Sig. (2-tailed)		.000
	N	41	41
UV	Pearson Correlation	.936[**]	1
	Sig. (2-tailed)	.000	
	N	41	41

Note:** Correlation is significant at the 0.01 level (2-tailed).

Discussion

The present work declared that a large section of the interviewed population (71%) was married and from the Malizai ethnicity. The majority of the population (69 %) had some formal education, while about 31 % were illiterate. Therefore, majority of the population depend upon natural resources (Siraj and Khan 2021). Most of the older respondents knew a lot about the various plants of the forest, including their local names and the significance of each one. *Punica granatum* is wild fruiting tree species grown naturally as compared to other fruiting trees which needs chemical for increase in production (Amin *et al.* 2022). Due to lack of basic life facilities, low life standard and unemployment, this tree species provides a wide opportunity as an income source to local inhabitants. Due to

multiple use (food, fodder, timber etc.) this specie is overexploited in the region and leads to decline in overall biodiversity. We conducted an extensive study on the detail information on the traditional uses of *Punica granatum* by the local community of District Dir lower Khyber Pakhtunkhwa, Pakistan. We corroborated ethnomedicinal usage of *Punica granatum* by pharmacological data. Overall, the present work revealed the traditional uses of *Punica granatum*, to treat different ailments. *Punica* belongs to Punicaceae, including shrubs and small trees up to six meters with profuse branching (Irshad *et al.* 2016). The family, which includes just one genus and two species, is found throughout the Mediterranean, from Iran to the Himalayas, including Pakistan, Afghanistan, Egypt, China, Iran, Iraq, Bangladesh, India, Burma, and Saudi Arabia (Soliva-Fortuny *et al.* 2002; Ali *et al.* 2022), Iran, Turkmenistan, and India (Rajaei & Yazdanpanah 2015). Pomegranates flourish on calcareous, alkaline, and sandy soils.

Results of the present work indicated that different parts of *Punica* were used by the local community of Dir lower for the treatment of cancer (Jeune *et al.* 2005), antioxidant (Jeune *et al.* 2005, Gil *et al.* 2000), Dysentery, skin illness, injury treatment and an antiseptic (Juernka 2008, Das & Barman 2012, Khan *et al.* 2014). A diverse set of treatments have also been used by peoples from all over the world. Since from the ancient times, it has been the most adored plant. Many ailments were treated with the plant by the Greeks and Romans. The most common uses of *Punica* plant found for the current work is dry Cough, stomach and urinary difficulties, diarrhea, bone and chest pain, dysentery, Diabetes, and throat infection. It is worth mentioning that in different countries has also been supported the same uses of Punica plant for treatment of various diseases. Altiplano region of Mexico, people utilize plant pericarp syrup to treat gum infections, aphthous ulcers, and mouth sores (Rosas-Piñón *et al.* 2012). Historically, peptic ulcers are treated with pomegranate seeds in Lorestan province in Iran (Delfane *et al.* 2015). The fruit, seed, and blossom of *Punica granatum* have long been used in Kerman Province, Iran, to cure skin blisters, skin tissue integrity, diarrhea in children, hypertension, and bleeding gums (Nasab & Khosravi 2014). People in Fars Province (Iran) utilize *Punica granatum* fruits to treat jaundice and as an appetizer (Dolatkhahi *et al.* 2014). The pericarp is used to treat kidney disorders in north-central area of Morocco (Jouad *et al.* 2001). Leaf, fruit, seed, and bark infusions, powders, and decoctions are used orally or externally to aid digestion in Agadir Ida Ou Tanane Province (Southwest Morocco) (Ouhaddou *et al.* 2014). The Brazilian community of Sobradinho has long used the plant to treat sore throats (Silva *et al.* 2015). The Turkish people use flower decoction to treat asthma (Uzun & Kaya 2016). Similarly, in Limpopo Province, South Africa, people utilize Punica granatum roots to treat diabetes mellitus (Semenya *et al.* 2012). People in Bangladesh's Boheratoli & Menkifanda, Netrokona areas have traditionally used root bark decoction to expel human worms (Partha & Hossain 2007). The plant is used to treat anemia in some districts of Dhaka, Bangladesh (Rahman *et al.* 2013). The Garo tribal people of Bangladesh utilize the plant's leaf paste to cure onychomycosis, a fungal infection of the nails (Rahmatullah *et al.* 2009). The pericarp is used in several formulations in Sulawesi (Makassarese, Buginese), Java (Javanese, Sundanese), Madura, and Vietnam to relieve tooth blackening. The bark decoction is used in the southeast of Honda (Algeria) to treat stomach aches, diarrhea, and ulcers (Sarri *et al.* 2015). Seeds are used to treat anemia and jaundice in Jammu & Kashmir. Seeds are utilized to help people recover from their weaknesses. They eat juice as an appetizer instead (Kumar *et al.* 2009). The fruit rind is traditionally used to treat diarrhea in the Parinche valley of Pune, Maharashtra (Jain *et al.* 2010). In the Satpuda district of Maharashtra, the plant is utilized for various therapeutic uses, including the treatment of fever, heart, and throat disorders. The plant can also be used as an antihelminthic, laxative, astringent, and memory booster (Tetali *et al.* 2009). Kani tribals in the Western Ghats' Tirunelveli hills ingest the fruit powder orally to relieve stomachaches (Ayyanar & Ignacimuthu 2011). The plant, which is made up of the entire plant, is used topically as an antivenom in Tamil Nadu's southern region (Samy *et al.* 2008). In rural areas often substitute the wild *Punica granatum* fruit for tomatoes during the winter months when the latter are scarce or prohibitively expensive (Irshad *et al.* 2016). They are used to make fruit juices in the summertime, while the fruit's peels treat stomach ailments and prostatic UTIs. According to Hussain *et al.* (2018), many visitors from the local area come to these forests in the summer to picnic, take photos, and collect fruit without paying a fee, according to participants in focus groups. Their emphasis was on issuing government officials and law enforcement agencies to collect money from district residents and government bodies.

Use value (Uv), Informant consensus factor (ICF) and fidelity level (FL) of each ailment of the species have highest number citation which indicating the significance of the *Punica* plant to the local people of the study area (Ahmad *et al.*, 2017). The plant was employed as an anthelminthic, astringent, refrigerant, and expectorant (Ali *et al.* 2017). In Pakistan's coastal districts, the fruit skin infusion is used to cure diarrhea, vomiting, and food poisoning (Qasim *et al.* 2014). People from tribes with fewer resources have Diabetes, diarrhea, piles, and dysentery treated using the plant's fruit in the Himalayas of Pakistan (Abbasi *et al.* 2013). Another interesting finding of the current work is that Punica plant most likely be used as an expectorant, anthelmintic, and antipyretic (Hassan *et al.* 2017). Domestic animals graze on the plant's leaves. The branches of the trees are cut and used as fuel. Their wood is tough and

long-lasting, and it's usually utilized to make farm implements. A black ink rich in tannins is obtained from the root bark and is useful in dyeing and leather (Sreekumar *et al.* 2014, Ali *et al.* 2017).

According to the survey respondents claimed that survival is attributed to a variety of factors, including human inaccessibility (18.4%), presence on high-altitude slopes (13.2%), fertile soil (13.2%), good water absorption (13.2%), the presence of protective spines (11.4%), strong secondary growth systems (10.5%), medicinal value (7.9%), drought resistance (7.0%), and rainfall frequency (7.0%). (Jurenka 2008). Firewood from plant stems and branches was cited by 17.1% of respondents as a possible cause of the problem. Excessive fruit consumption and high palatability have accounted for 15.50% of the increase in human accessibility, while soil erosion has accounted for 12.4% of soil erosion. 6.2% because of a lack of security, 5.4% for being located in locations not suited for expansion, 3.9% for being vulnerable, and 2.3% for being duplicative (Sadeghi and Kuhestani, 2014). To make medicine, 27.6% used the powdered form, 26.2% the water-water mixture, 17.2% the sweetened powder, 10.3% the seed, 2.8% the opium-opium mixture, 5.5% the milk-milk mixture, 2.1% the vegetable-vegetable mixture, 1.4% the extraction of juice from the seeds, and a small part of the fruit bark were the other uses (Ali *et al.* 2017). Borers, birds, bats, and squirrels may be protected from borers, birds, bats, and squirrels in some countries by covering the fruits with paper or plastic bags or other covers. Carbendazim treatment is efficient against fungal illness and preserves the fruits from harm.

Conclusion and Recommendations

Ecologically and commercially, *P. granatum* woods are essential. The proximity of the woods to the resorts, the accessibility of the wild animals, and the beautiful scenery and delicious fruits attract local guests. In addition to this, the local people's interest in thatch grass, which they collect from the woods, indicates the forests' long-term viability. Furthermore, except for occasional concerns about damage to agriculture caused by wild animals, most local responders favored forest preservation. While the forests of *P. granatum* are essential for their ecological, social, and economic value, they are not well managed. Therefore, it's time to make the following recommendation.

- ➢ Management of the region by local people and interested governments or non-governmental organizations (NGOs) for the sustainable use of forest resources.
- ➢ Schools, eco-clubs, and community members' experience-sharing travels (visits) are all ways to increase conservation education and public awareness.
- ➢ Assign competent individuals to conserve and restore the Punica woods, using community members who are well-versed in the subject and have a greater propensity to be taken seriously when speaking on behalf of their community and elders.
- ➢ Continue building and maintaining fences and access roads in the woods and constructing new water sources based on well-articulated design and the most convenient places.
- ➢ In allocating available benefits, all recipients are treated equally and fairly.

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Conflict of interest: The authors declare that they have no conflict of interest
List of abbreviations: Not applicable
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Literature cited
Abbas W, Hussain W, Hussain W, Badshah L, Hussain K, Pieroni A. 2020. Traditional wild vegetables were gathered by four religious' groups in Kurram District, Khyber Paktunkhwa, North-West Pakistan. Genetic Recourse Crop Evolution 67:1521-1536.

Abbasi AM, Khan MA, Shah MH, Shah MM, Pervez A, Ahmad M. 2013. Ethnobotanical appraisal and cultural values of medicinally important wild edible vegetables of Lesser Himalayas-Pakistan. Journal of Ethnobiology and Ethnomedicine 9(1):1-13.

Adeniyi A, Asase A, Ekpe PK, Asitoakor BK, Adu-Gyamfi A, Avekor PY. 2018. Ethnobotanical study of medicinal plants from Ghana; confirmation of ethnobotanical uses, and review of biological and toxicological studies on medicinal plants used in Apra Hills Sacred Grove. Journal of Herb and Medicine 14:76-87.

Ahmad L, Riaz M, Jan HA, Semotiuk AJ, Ahmad I, Khan I, Ali F, Rashid W, and Bussmann RW. 2021. An ethnobotanical survey of wild food plants used by the local communities of Kumrat Valley in District Upper Dir, Pakistan. Ethnobotany Research and Applications 22.

Ahmad KS, Hamid A, Nawaz F, Hameed M, Ahmad F, Deng J, Akhtar N, Wazarat A, Mahroof S. 2017. Ethnopharmacological studies of indigenous plants in Kel village, Neelum Valley, Azad Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 13:68.

Ali F, Khan N, Abd_Allah EF, Ahmad A. 2022. Species Diversity, Growing Stock Variables and Carbon Mitigation Potential in the Phytocoenosis of *Monotheca buxifolia* Forests along Altitudinal Gradient across Pakistan. Applied Sciences 12(3):1292.

Ali F, Khan N, Ahmad A, Khan, AA. 2019. Structure and biomass carbon of *Olea ferruginea* forests in the foothills of Malakand division, Hindukush range mountains of Pakistan. Acta Ecologica Sinica 39(4):261-266.

Ali K, Ullah F, Khan N, Rahman IU, Ullah S, Khan W, Ali M, Uddin N, Nisar M. 2017. Ethnobotanical and ecological study of Myrtus communis (L.) in Bajaur agency (FATA) Khyber-Pakhtunkhwa, Pakistan. Journal of Biodiversity and Environmental Sciences 11(1):152-164.

Amin M, Gurmani AR, Ali F, Khan SM, Farid A, Shakur M & Khan W. 2022. Investigation of multi-pesticide residues in *Prunus persica* L. (peach) cultivars of district Swat using gas chromatography-mass spectroscopy. Polish Journal of Environmental Studies 31(2):1535-1542.

Asase A, Kadera M. 2014. Herbal medicines for child healthcare from Ghana. Journal of Herb and Medicine 4:24-36.

Ayyanar M, Ignacimuthu S. 2011. Ethnobotanical survey of medicinal plants commonly used by Kani tribals in Tirunelveli hills of Western Ghats, India. Journal of ethnopharmacology 134(3):851-864.

Das S, Barman S. 2012. Antidiabetic and antihyperlipidemic effects of ethanolic extract of leaves of Punica granatum in alloxan-induced non-insulin-dependent diabetes mellitus albino rats. Indian Journal of Pharmacology 44(2):219.

Delfan B, Bahmani M, Hassanzadazar H, Saki K, Rafieian-Kopaei M, Rashidipour M, Sharifi A. 2015. Ethnobotany study of effective medicinal plants on gastric problems in Lorestan province, West of Iran. Journal of Chemical and Pharmaceutical Research (2):483-492.

Dhandar D G, and Singh D B. 2002. Current status and future needs for the development of pomegranate. In: Program and discussion papers, National Horticulture Conference, New Delhi:12.

Dolatkhahi M, Dolatkhahi A, Nejad JB. 2014. Ethnobotanical study of medicinal plants used in Arjan-Parishan protected area in Fars Province of Iran. Avicenna Journal of Phytomedicine 4(6):402.

Farooq A, Amjad MS, Ahmad K, Altaf M, Umair M, Abbasi MA. 2019. Ethnomedicinal knowledge of the rural communities of Dhirkot, Azad Jammu and Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 15:45.

Giday K, Lenaerts L, Gebrehiwot K, Yirga G, Verbist B, Muys BX. 2017. Ethnobotanical study of medicinal plants from degraded dry afromontane forest in northern Ethiopia: Species, uses and conservation challenges. Journal of Herb and Medicine 6:96-104.

Gil MI, Tomás-Barberán FA, Hess-Pierce B, Holcroft DM, Kader AA. 2000. Antioxidant activity of pomegranate juice and its relationship with phenolic composition and processing. Journal of Agricultural and Food Chemistry 48(10):4581-4589.

Gulzar H, Hazrat A, Gulzar K, Ali F, Khan N, Nisar M. & Ullah A. 2019. Medicinal plants and their traditional uses in thana village, district malakand, khyber pakhtunkhwa, Pakistan. International Journal of Endorsing Health Science Research 7(1):11-21.

Hao DC, Xiao PG. 2020. Pharmaceutical resource discovery from traditional medicinal plants: Pharmacophylogeny and pharmacophylogenomics. Chines Journal of Herb and Medicine 9:11.

Hassan SM, Sultana B, Iqbal M, Naz S, Abbas M. 2017. Anti-aflatoxigenic activity of Punica granatum and Ziziphus jujuba leaves against *Aspergillus parasiticus* inoculated poultry feed: Effect of storage conditions. Biocatalysis and Agricultural Biotechnology 10:104-112.

Heinrich M, Ankli A, Fre B, Weimann C, Sticher O. 1998. Medicinal plants in Mexico: Healers consensus and cultural importance. Social Sciences and Medicine 47:1859-1871

Huda MN. 2013. Understanding indigenous people's perception on climate change and climatic hazards:a case study of Chakma indigenous communities in Rangamati Sadar Upazila of Rangamati District, Bangladesh. Natural Hazards 65(3):2147-2159.

Hussain W, Badshah L, Ullah M, Ali M., Ali A, Hussain F. 2018. Quantitative study of medicinal plants used by the communities residing in Koh-e-Safaid Range, northern Pakistani-Afghan borders. Journal of Ethnobiology and Ethnomedicine 14:30.

Hussain W, Hussain J, Ali R, Khan I, Shinwari ZK, Nascimento IA. 2012. Tradable and conservation status of medicinal plants of Kurram Valley. Parachinar, Pakistan. Journal of Applied Pharmaceutical Science 2:66-70.

Irshad M, Khan N, Ali K, Muhammad Z. 2016. The influence of environmental variables on *Punica granatum* L. assemblages in subtropical dry temperate woodland in the district of Lower Dir, Khyber Pakhtunkhwa, Pakistan. Turkish Journal of Botany 40(6):610-622

Jan HA, Jan S, Bussmann RW, Wali S, Sisto F, Ahmad L. 2020. Complementary and alternative medicine research, prospects and limitations in Pakistan:a literature review. Acta Ecologica Sinica 40(6):451-463.

Jain DL, Baheti AM, Jain SR, Khandelwal KR. 2010. Use of medicinal plants among tribes in Satpuda region of Dhule and Jalgaon districts of Maharashtra-an ethnobotanical survey. Indian Journal of Traditional Knowledge 9(1): 152-157.

Jeune MA, L, Kumi-Diaka J, Brown J. 2005. Anticancer activities of pomegranate extracts and genistein in human breast cancer cells. Journal of Medicinal Food 8(4):469-475.

Jouad H, Haloui M, Rhiouani H, El Hilaly J, Eddouks M. 2001. Ethnobotanical survey of medicinal plants used for the treatment of diabetes, cardiac and renal diseases in the North centre region of Morocco (Fez-Boulemane). Journal of Ethnopharmacology 77(2-3):175-182.

Jurenka J. 2008. Therapeutic applications of pomegranate (Punica granatum L.): A review. Alternative Medicine Review 13(2):128.

Kangl A, Moon SK, Cho SY, Park SU, Jung WS, Park JM, Ko CN, Cho KH, Kwon S. 2020. Herbal medicine treatments for essential tremor:A retrospective chart review study. Journal of Herb and Medicine 19:100295.

Kanwal H, Sherazi BA. 2017. Herbal medicine: Trend of practice, perspective, and limitations in Pakistan. Asian Pacific Journal of Health Science 4:6-8.

Kayani S, Ahmad M, Zafar M, Sultana S, Khan MPZ, Ashraf, MA, Hussain J, Yaseen G. 2014. Ethnobotanical uses of medicinal plants for respiratory disorders among the inhabitants of Gallies-Abbottabad, Northern Pakistan. Journal of Ethnopharmacology 156:47-60.

Khan AA, Ali F, Ihsan M, Hayat K, & Nabi G. 2015. Ethnobotanical study of the medicinal plants of Tehsil Charbagh, district Swat, Khyber Pakhtunkhwa, Pakistan. American Eurasian Journal of Agriculture and Environmental Sciences 15:1464-1474.

Khan N, Ali K, Shaukat S. 2014. Phytosociology, structure and dynamics of Pinus roxburghii associations from Northern Pakistan. Journal of Forestry Research 25(3):511-521.

Kpodar MS, Lawson-Evi P, Bakoma B, Eklu-Gadegbeku P, Agbonon A, Aklikokou A, Gbeassor M. 2015. Ethnopharmacological survey of plants used in the treatment of diabetes mellitus in south of Togo (Maritime Region). Journal of Herb and Medicine 5:147-152.

Kumar M, Paul Y, Anand VK. 2009. An ethnobotanical study of medicinal plants used by the locals in Kishtwar, Jammu and Kashmir, India. Ethnobotanical Leaflets 2009(10):5.

Mahomoodally F, Suroowan S, Sreekeessoon U. 2018. Adverse reactions of herbal medicine a quantitative assessment of severity in Mauritius. Journal of Herb Medicine.

Malik K, Ahmad M, Zafar M, Ullah R, Mahmood HM, Parveen B, Rashid N, Sultana S, Shah SN. 2019. An ethnobotanical study of medicinal plants used to treat skin diseases in northern Pakistan. BMC Complementary Alternative Medicine 19:210.

Mushtaq SM, Gangoo SA. 2017. Anardana (dehydrated wild pomegranate arils) as livelihood option for rural communities in Chenab valley of Jammu and Kashmir. Indian Journal of Horticulture 74(2):306-309.

Nasab FK, Khosravi AR. 2014. Ethnobotanical study of medicinal plants of Sirjan in Kerman Province, Iran. Journal of Ethnopharmacology 154(1):190-197.

Ong HG, Kim YD. 2014. Quantitative ethnobotanical study of the medicinal plants used by the Ati Negrito indigenous group in Guimaras Island, Philippines. Journal of Ethnopharmacology 157:228-242.

Ouhaddou H, Boubaker H, Msanda F, El Mousadik A. 2014. An ethnobotanical study of medicinal plants of the Agadir Ida Ou Tanane province (southwest Morocco). Journal of Applied Biosciences 84:7707-7722.

Partha P, Hossain AE. 2007. Ethnobotanical investigation into the Mandi ethnic community in Bangladesh. Bangladesh Journal of Plant Taxonomy 14(2):129-145.

Petrakoua K, Iatroub G, Lamari FN. 2020. Ethnopharmacological survey of medicinal plants traded in herbal markets in the Peloponnisos, Greece. Journal of Herb and Medicine 19:100305.

Qasim M, Abideen Z, Adnan MY, Ansari R, Gul B, Khan MA. 2014. Traditional ethnobotanical uses of medicinal plants from coastal areas. Journal of Coast Life Medicine 2(1):22-30.

Rahman AM, Sultana N, Islam AR, Zaman ATMN. 2013. Study of medical ethno-botany at the village Genda under Savar Upazilla of District Dhaka, Bangladesh. Journal of Medicinal Plants 1(5).

Rahmatullah M, Mukti IJ, Haque AKMF, Mollik MAH, Parvin K, Jahan R, … & Rahman T. 2009. An ethnobotanical survey and pharmacological evaluation of medicinal plants used by the Garo tribal community living in Netrakona district, Bangladesh. Advances in Natural and Applied Sciences 3(3):402-418.

Rajaei H, Yazdanpanah P. 2015. Buds and leaves in pomegranate (*Punica granatum* L.):Phenology in relation to structure and development. Flora 214:61-69.

Rashid N, Gbedomon RC, Ahmad M, Salako VK, Zafar M, Malik K. 2018. Traditional knowledge on herbal drinks among indigenous communities in Azad Jammu and Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 14:16.

Rawat JMS, Tomar YK, Rawat SS. 2008. Effect of stratification on seed germination and seedling performance of wild pomegranate. Progressive Agriculture 8(1):15-16.

Rosas-Piñón Y, Mejía A, Díaz-Ruiz G, Aguilar MI, Sánchez-Nieto S, Rivero-Cruz JF. 2012. Ethnobotanical survey and antibacterial activity of plants used in the Altiplano region of Mexico for the treatment of oral cavity infections. Journal of Ethnopharmacology 141(3):860-865.

Sadeghi Z, Kuhestani K. 2014. Ethnobotany of date palm (Phoenix dactylifera) in Baluch tribe of Saravan region, Baluchistan, Iran. Journal of Agricultural Technology 10(6):1571-1585.

Samy RP, Thwin MM, Gopalakrishnakone P, Ignacimuthu S. 2008. Ethnobotanical survey of folk plants for the treatment of snakebites in Southern part of Tamilnadu, India. Journal of Ethnopharmacology 115(2):302-312.

Sarri M, Boudjelal A, Hendel N, Sarri D, Benkhaled A. 2015. Flora and ethnobotany of medicinal plants in the southeast of the capital of Hodna (Algeria). Arabian Journal of Medicinal and Aromatic Plants 1(1):24-30.

Semenya S, Potgieter M, Erasmus L. 2012. Ethnobotanical survey of medicinal plants used by Bapedi healers to treat diabetes mellitus in the Limpopo Province, South Africa. Journal of Ethnopharmacology 141(1):440-445.

Shinwari ZK, Qaisar M. 2011. Efforts on conservation and sustainable use of medicinal plants of Pakistan. Pakistan Journal of Botany 43:5-10.

Silva JD, Nascimento MG, Castro KN, Andrade IM. 2015. Ethnobotanical survey of medicinal plants used by the community of Sobradinho, Lus Correia, Piau, Brazil. Journal of Medicinal Plants Research 9(32):872-883.

Singh D and Sethi V. 2003. Screening of pomegranate genotypes for the preparation of quality grade anardana. Journal of Food Science Technology 40(2):236-238

Siraj, Khan N. 2021. Quantitative ethnobotany of *Calotropis procera* and associated vegetation: a step forward for conservation and management practice in northern areas of Pakistan. Ethnobotany Research and Applications 22:1-17.

Soliva-Fortuny RC, Elez-Martínez P, Sebastián-Calderó M, Martín-Belloso O. 2002. Kinetics of polyphenol oxidase activity inhibition and browning of avocado puree preserved by combined methods. Journal of Food Engineering 55(2):131-137.

Sreekumar S, Sithul H, Muraleedharan P, Azeez JM, Sreeharshan S. 2014. Pomegranate fruit as a rich source of biologically active compounds. Bio Medicinal Research International.

Tetali P, Waghchaure C, Daswani PG, Antia NH, Birdi TJ. 2009. Ethnobotanical survey of antidiarrhoeal plants of Parinche valley, Pune district, Maharashtra, India. Journal of ethnopharmacology 123(2):229-236.

Ullah S, Badshah L, Ali A, Muhammad N. 2020. Quantitative assessment and status of ethnomedicinal plants of Sheen Ghar Valley, Dir Lower, Khyber Pakhtunkhwa, Pakistan. Plant Science Today 7(1):17-22.

Umair M, Altaf M, Abbasi AM. 2017. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. PLoS ONE 12:e0177912.

Uzun M, Kaya A. 2016. Ethnobotanical research of medicinal plants in Mihalgazi (Eskişehir, Turkey). Pharmaceutical B iology 54(12):2922-2932.

Wagh VV, Jain AK. 2020. Ethnopharmacological survey of plants used by the Bhil and Bhilala ethnic community in dermatological disorders in Western Madhya Pradesh, India. Journal of Herb and Medicine 19:100234.

White PC, Jennings NV, Renwick AR, Barker NH. 2005. Questionnaires in ecology: a review of past use and recommendations for best practice. Journal of applied ecology 42(3):421-430.

Dear Respondent,

This questionnaire will require a few minutes of yours for filling it out.

Semi-structured questionnaires for the collection of information regarding the ethnobotanical, ecological, and socio-economic issues related to *Punica granatum* distributed in **District Dir Lower Khyber Pakhtunkhwa, Pakistan.**

General information

Tribe_____Village_____

Gender: Female_____ Male_____Age_____

Level of Education 1_____ 2_____ 3_____ 4_____

Key: 1-Elementary 2- junior secondary 3- High school 4-Above high school level

1) For how long you lived in this area?

_____

2) What is your occupation?

_____

_____

3) Did you know about *Punica granatum*?

Yes _____No _____

4) If yes, in what context?

_____

_____

5) What you call *Punica granatum* in your language?

_____

_____

6) What is the status of *Punica granatum*?

_____

_____

7) Habitat of *Punica granatum*?

_____

_____

9) Growing season of *Punica granatum* in your area?

_____

_____

10) Leaves of *Punica granatum* is used for?

_____

_____

11) Roots of *Punica granatum* is used for?

_____

12) Peel of *Punica granatum* is used for?

_____

_____

13) Stem of *Punica granatum* is used for?

_____

_____

14) Flower of *Punica granatum* is used for?

_____

15) Fruit of *Punica granatum* is used for?

_____

_____

16) Seed of *Punica granatum* is used for?

_____

_____

17) What benefit you get from *Punica granatum*?

_____

_____

18)What type of remedies you get from *Punica granatum*?

_____

_____

19) Mention some remedies of *Punica granatum*?

_____

_____

20) How to protect *Punica granatum* from unwise utilization?

_____

_____

21) Do you think any rule for protection of *Punica granatum*?

_____

_____

22) What type of punishment should be given who broke the rules?

_____

_____

23) What do you want to be done from the government side to reduce the utilization of *Punica granatum*?

_____

_____

24) What do you want to be done from the local people to reduce the utilization of *Punica granatum*?

_____

_____

25) Mention reasons of extinction of *Punica granatum*?

a) _____

b) _____

c) _____

d) _____

26) Mention reasons of survival of *Punica granatum*?

a) _____

b) _____

c) _____

d) _____

29) How to control the cutting of *Punica granatum* during young stage?

_____

_____

<<Thanks>>