



# A study on different plant species of the Rosaceae family and their ethnobotanical uses among the local communities at Swat district, Pakistan

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## Research

### Abstract

*Background:* The study area possess 55 plants of the family Rosaceae, which are widely used traditionally throughout the area. The family contains a range of plants that have high ethnobotanical and economical value. The family is well-known for its economically valuable fruits and medicinal plants. As a result, the purpose of this study was to collect ethnobotanical data of the Rosaceae family from Swat district in order to provide comprehensive documentation for future research.

*Methods:* The ethnobotanical data was collected from 2021 to 2022 from 80 respondents by using semi-structured questionnaires, open-ended questionnaires, and personal observations. The interviewed participants were mostly herbalists, farmers, folk healers, shepherds, and knowledgeable group members, age from 30 to 80 years. All the collected data was analyzed through Microsoft Excel (2016).

*Results:* There were 55 plant species of the family Rosaceae existing in the area, including 7 (13%) climbing shrubs, 19 (34%) herbs, 11 (20%) shrubs, and 18 (33%) tree species. Results of the present study showed that 85% of the plants in the family were utilized as medicinal in the area, followed by honeybees (44%), fuel wood (33%), foods (33%), fodder (31%), fencing (25%), ornamentals (14%), timber (7%), and (7%) plants were used for making agricultural tools. The most common part used as medicine was fruits (43%), followed by shoot (30%), leaves (13%), flowers (6%), roots (4%) and other parts were used (4%). Powder was the most commonly used preparation method (32%), followed by decoction (28%), direct consumption (19%), juice extraction (17%), and other methods (6%). Results of the present study indicated that plants of the family Rosaceae were highly economical for the native communities of the area.

*Conclusion:* This study provides awareness to the native community and the worldwide trend towards native information, regeneration and transmission of knowledge. Furthermore, this study of the family's ethnobotanical uses will provide a foundation for future research in the family.

*Keywords:* Ethnobotanical, Diversity, Family Rosaceae, Swat

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## Background

The family Rosaceae is a medium sized family of flowering plants, containing about 4828 species and 81 genera (Christenhusz *et al.*, 2016) with cosmopolitan distribution. The family consists of herbs, shrubs, and trees (Watson *et al.*, 1992), and it produces a variety of profitable and important goods, including numerous palatable fruits. Plants in the family have a diverse architecture and a large number of hybrids and ploidy levels. It contains significantly higher number of fruits and ornamental plants like plum, apple, peach, pear, cherry, almond, strawberry, raspberry. Flowering cherries and roses are of enormous economic and agronomic worth. The family has morphologically diverse fruits, such as fleshy, pome, drupe, achenetum, and dry (Xiang *et al.*, 2017, Liu *et al.*, 2020). The value of the family's eatable crops, on the other hand, is primarily due to the economic significance of their fruits, which provide specific endeavors to the flushed food for the user. In this context, their role as a source of phytochemicals and antioxidants has been well established for millennia (Swanson, 1998; Shulaev *et al.*, 2008). Throughout the ancient period, fruits of the Rosaceae populated indigenous anthropoid environment and fruits from these species were priceless roots of nutrients. As a result, a hundred years of variety and flexibility resulted in the spectacular change in fleshy fruit size that distinguishes currently commercialized fruit from their wild relatives (Shulaev *et al.*, 2008). The family is well-known for its therapeutic and economical potential, containing a variety of plant species, including numerous economically important plants that furnish dietary and health welfare for the anthropoids (Soundararajan, 2019). It is one of the six most economically valuable families of essential plants, with highly valued ornamental plants (Watson and Dallwitz, 1992). The family contains numerous prominent and adored plant species in regards of economic value, especially palatable temperate zone fruits and ornamentals, but also some timber plants and medicinals (Janick, 2005). It is a heterogeneous family that is often classified into four distinct subfamilies and about 20 tribes based on fruit types and carpel features (Kalkman, 1988).

The family is represented by 160 species in 27 genera and 4 subfamilies in Pakistan (Landrein *et al.*, 2009). Various plants of the family are frequently found in Pakistan and are utilized by many ethnic masses for curing diseases (Khan and Shinwari, 2016). Around 55 species of the family were found in Swat, with around 20 plants being reported as ethnobotanically important by various researchers from the area, including (Akhtar *et al.*, 2013, Ali *et al.*, 2011, Kishwar *et al.*, 2018, Hamayun and Iqbal 2004, Hamayun, 2005, Ilyas, 2015, Ibrar *et al.*, 2011, Khan *et al.*, 2015, Mushtaq *et al.*, 2014, Shah *et al.*, 2016, Sher *et al.*, 2020, Nabi *et al.*, 2015, Sher and Mohammad, 2011, Hamayun *et al.*, 2005, Hussain *et al.*, 2006, Sher and Hussain, 2009). The highest number of ethnobotanically important plants of the family were reported by Ilyas *et al.* (2013) which was almost 15 species, followed by Hamayun and Iqbal (2004) who report of 14 plant species and Sher *et al.* (2010) reported 11 plant species from the area.

Indigenous people of the area commonly use the family Rosaceae for ethnobotanical and economic aspects. Local people cultivate various species and varieties of the family for economic reasons, and several wild species also have great importance in the area. Although the ethnobotanical importance of the family was not properly documented in the area. Thus, the study was designed with two main goals in mind: (1) to conduct a large-scale examination of the diversity and population size of species belonging to the Rosaceae family; and (2) to document the ethnobotanical application of the Rosaceae family and its importance among the Swat native people.

## Materials and Methods

### Study Area

The current study was conducted in Swat, Pakistan. The valley of Swat is famous for its intrinsic beauty, snow-covered peaks, plentiful waterfalls, cold springs, streams, pastures, glaciers, lush greenery, and thick forests. It is the most popular tourist destination (Khaliq, 2018). Due to its attractiveness, people describe it as the Switzerland of Asia. Swat is a vast piece of land that comprises seven tehsils and 65 union councils, out of which 56 are rural and the remaining are urban areas. It covers an area of about 5,337 Km<sup>2</sup>. Valleys and ravines surround the area on all sides (William Henry, 1874). Above the mountain ridges, the valley of the Panjkora River is located in the west zone, the Gilgit valley is located in the north zone, and the Indus River Gorges are located in the east zone of the area. A series of low mountains in Peshawar Valley can be found in the south zone (Barth, 2020). The area was a major center of early Buddhism during the Gandhara civilization, which lasted until the tenth century; later, the Swat region became heavily Muslim (Niaz, 2007). Swat is the highest-altitude area in Pakistan. The average elevation is 980 meters above sea level. Therefore, the area faces four climatic conditions: spring, summer, winter, and autumn. The upper area of the district, such as Kohistan, is extremely cold in winter and covered in snow throughout the year. While the lower plains are dry and hot in the summer, temperatures can almost reach 41°C. Therefore, the lower parts of the district get infrequent snowfall. Both the upper and lower parts of the area contain two monsoon cycles. The first occurs in the winter, while the second occurs in the summer. The lower Swat has vegetation like

dry bushes and deciduous trees, while the upper region is covered by thick pine forests. Pashtuns make up roughly 90% of the population in the area, with the Yusufzai being the most common tribe (Niaz, 2007).

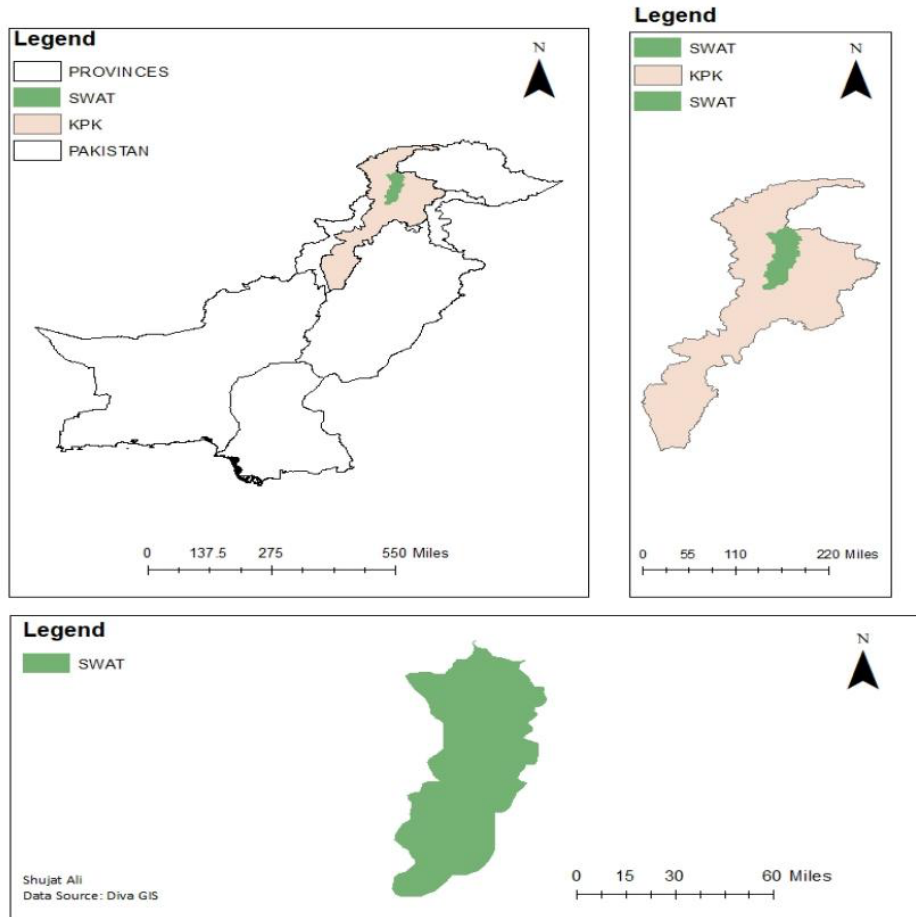


Figure 1. Map of study area

### Data collection

The field work for the current study was carried out from 2021 to 2022, including 80 people. Mostly herbalists, farmers, folk healers, shepherds, and old experienced people were selected for interviews from the area. The age range was from 30 to 80 years, with an average age of 55. About 10 villages were selected from each tehsil of the district for data collection; these were mostly remote villages where a great variety of plant species of the same family are found in different ecological conditions. The lower Swat was explored from December to March, while the upper Swat was explored from May to September because the upper regions of the district were extensively covered by snow in the winter season. During interviews with local people, they stated that traditional information about plants is transmitted through generations. The obtained information was compared with that of other informants or with previous literature. The medicinal plant data acknowledged in this study was confirmed by at least three to four respondents. In the field, personal observation confirmed that each knowledgeable person is able to identify the mentioned plant in the wild. The collected plants and their ethnobotanical applications were confirmed by local experts before entry in Microsoft Excel 2016. All collected plant species were pressed through a presser and arranged for taxonomic identification. Moreover, the collected plants were identified according to the Flora of Pakistan (Nasir and Ali, 1970-1979; Nasir and Ali, 1980-1989; Ali and Nasir, 1989-1992; Ali and Qaiser, 1993-2009) and the online platform Flora of China. The plants were then confirmed using the Flora of Pakistan Tropicos.

### Questionnaire

In the present study, a semi-structured questionnaire was used to acquire relevant ethnobotanical data from the local people of Swat. Basically, the questionnaire was divided into three portions. The first part of the questionnaire

contained demographic data such as age, gender, religion, nationality, level of education, native language, name of village, years of living, profession, source of knowledge, professional experience, having livestock or not, sort of livestock, livestock number and yearly profit from livestock. While the second section of the questionnaire included the plant's local and scientific names, habitat, medicinal uses, flavor and spice uses, plant use as veterinary medicine, method of preparation, quantity harvested, and collector of the plant, ethnic group, marketing value, quantity sold, Price range, plant conservation status (common, abundant, or rare), changes in plant quantity over the last ten years, method of collection, traditional methods of transporting medicinal plants after harvesting, and whether traditional methods deliver results or not. Furthermore, the third part of the questionnaire contained ethnobotanical information such as plants used as food (cooked raw or fresh), parts used for cooking, plants used as fuel, furniture, agriculture tools, honeybees, ornamental, fodder, timber, and what uses the plant has. Generally, the meeting was carried out in Pashto because the residents of the area were mostly Pashto speakers. Therefore, the questionnaire was translated and interpreted orally to them in their native language, and responses were filled into the questionnaire after each interview.

Table 1. Total tehsil of district Swat

Tehsil	Population	Latitude	Longitude	Avg Elevation	Avg rainfall	Avg Temp
Bahrain	102,253	35.2072° N	72.5456° E	1433 m	866 mm	16.6 °C
Barikot	184000	34.6568° N	72.2127° E	808 m	726 mm	19.6°C
Babuzai	25,386	34.4232° N	72.1387° E	987 m	897 mm	21°C
Charbagh	39,605	34.8346° N	72.5441° E	1032 m	897 mm	12°C
Kabal	420,374	34.7923° N	72.2825° E	845 m	897 mm	17.1°C
Khowazakhela	265,571	34.9371° N	72.4687° E	1151 m	965 mm	16°C
Matta	465,599	34.9307° N	72.4169° E	1969 m	965 mm	23°C

#### Demographic characteristics of study participants

The data was collected through semi-structured questionnaires and face-to-face interviews with local inhabitants. The demographic characteristics of the individuals were determined and documented. Furthermore, interviews were conducted with approximately 80 people ranging in age from 30 to 80. The respondents' average age was 55. Approximately 20 people were female and 60 people were male during the survey. Out of these 30 individuals were farmers, 20 shepherds, 10 were school students, 10 were uneducated, 5 were university graduates, and 5 were teachers as shown in table 2.

Table 2. Demographic information of the participants

Demographic characteristics	Number of respondents	Percentage %
<b>Age</b>		
30 to 50	30	37.5
50 and above	50	62.5
<b>Sex</b>		
Male	60	75
Female	20	25
<b>Residential status</b>		
Villages	50	62.5
Township	30	37.5
<b>Educational Status</b>		
Matriculate	10	12.5
Teachers	5	6.25
University Graduate	5	6.25
Farmer	30	37.5
Shepherds	20	25
Uneducated	10	12.5

## Results

Swat's indigenous people have a prosperous culture and a rich history of traditional cultures involving the use of indigenous flora. Among the usable families, Rosaceae is quite valuable and is widely used in the area for medicine, food, timber, and ornamental purposes. As a result, this study was carried out to collect ethnobotanical data on the Rosaceae family from Swat district.

### Taxonomic diversity and medicinal Plants the family

A total of 55 plant species documented from the area that were used for ethnobotanical purposes, including 7 (13%) climbing shrubs, 19 (34%) herbs, 11 (20%) shrubs and 18 (33%) tree species as shown in Fig. 1. About 54 species were used for multiple purposes such as for curing diseases, as fuel wood, timber, foods, fodder, and forage for cattle while one species (*Sibbaldia procumbens*) had no ethnobotanical use as shown in Table (3). The most commonly used parts were fruits (43%), followed by shoots (30%), leaves (13%), flowers (6%), roots (4%), and other parts were used (4%). While, the most commonly used methods of preparation were powder (32%), decoction (28%), direct consumption (19%), juice extraction (17%), and other methods were used (6%) as shown in Table 3. Results of the present study showed that 47 (85%) plants of the family were used as medicine because the family has high medicinal value in the area. Native communities of the area used these plants to cure different diseases, including gastrointestinal disorders and microbial infections, blood problems, headache, hepatitis, diarrhea, kidney stone, antioxidant, wound healing, urinary tract infections, asthma, constipation, heart problems, diabetes as shown in Table 3. The study indicated that plants of the family reported in this study are still commonly utilized in the area for ethnobotanical purposes.

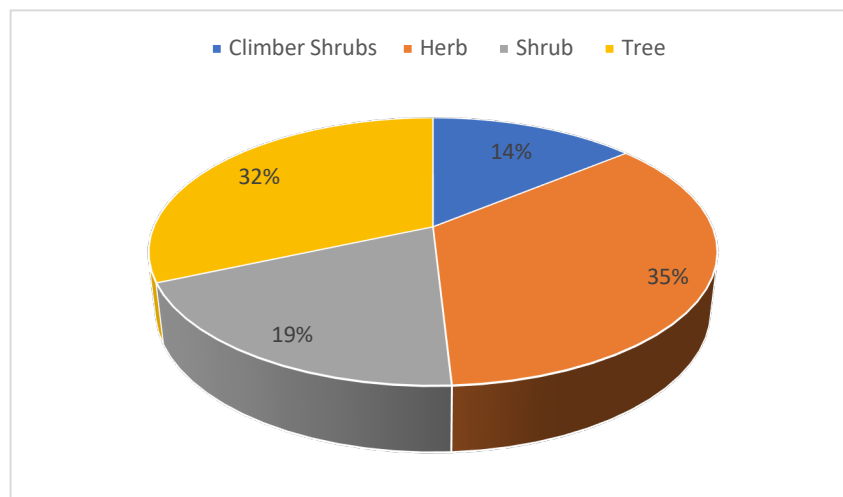


Figure 1. Plants form of the family

### Fuelwood

The study revealed that about 18 (33%) plants were used as fuel. Although cutting is the most common practice in the area for healthy growth and maximum production of orchards. Professional choppers are used to cut orchards of *Prunus avium*, *Prunus cerasifera*, *Prunus amygdalus*, *Prunus armeniaca*, *Prunus cerasoides*, *Prunus cornuta*, *Prunus domestica*, *Prunus persica*, *Pyrus communis*, *Pyrus pashia*, *Cydonia oblonga*, *Malus baccata*, and *Malus domestica*. People dry and store these wood cuttings for burning purposes. While poor people with no land in the area collected and burnt *Cotoneaster minutus*, *Cotoneaster affinis*, *Cotoneaster integerrimus*, *Sorbaria tomentosa*, and *Crataegus songarica* from the wild, as shown in Table 3. The study found that use of fuel wood was minimal during the summer season from March to October but increased during the winter season from November to February due to long and harsh winters and inaccessibility of resources in the study area.

### Fodder

Fodder is one of the main goods trade in the study area due to demand for high utilization. The accessibility of fodder becomes insufficient in the region, particularly in the winter and early springtime. As a result, fodder is purchased for livestock during respective seasons and stored for the off-season. The results of the present study showed that about 17 (31%) plant species were utilized as fodder for livestock because domesticated animals are one of the main source of income for local communities in the area. People, mostly shepherds, collected leaves of *Prunus cerasifera*, *Prunus persica*, *Pyrus communis* and *Malus baccata* during the autumn season and stock them

for winter uses. While leaves of *Rubus fruticosus*, *Agrimonia eupatoria*, *Duchesnea indica*, *Fragaria nubicola*, *Fragaria vesca*, *Geum alatum*, *Potentilla argentea*, *Potentilla atrosanguinea*, *Sanguisorba filiformis*, *Geum urbanum*, *Potentilla reptaris*, *Spiraea canescens*, and *Sorbus aria* eaten by goats and sheep as shown in Table 3.

### Fencing and Hedging

People are mostly farmers in the area. They grow various crops in their fields that need protection from grazing, feeding, and short cut paths. There are many porcupines in the hillsides that destroy crops for their own food, people live in the hillsides, fencing their crops to protect them from porcupines and other herbivores. In this study, about 14 (25%) plants documented are used for fencing purposes in the area. The most widely used plants of the family were *Rosa brunonii*, *Rubus fruticosus*, *Rosa webbiana*, *Rubus niveus*, *Rubus sanctus*, *Cotoneaster microphyllus*, *Cotoneaster numularia*, and *Rosa chinensis* etc., as shown in Table 3.

### Timber and Thatching

Most of the hillside residents live in stony homes made up of stones, mud, and wood. Wood is highly utilized in the construction of homes. About 4 (7%) plants of the family were used for timber, thatching, roofing, and sheltering purposes in the area, such as *Cotoneaster numularia*, *Prunus avium*, *Sorbus aria* and *Cotoneaster microphyllus* as shown in Table 3.

### Agricultural tools

The majority of the people in the area were farmers who used traditional farming tools. Therefore, they utilize wood of 4 (7%) plants species such as *Malus domestica*, *Crataegus songarica*, *Prunus armeniaca* and *Prunus cornuta* for making handles and other parts of sickles, harrows, hoes, axes, etc., and one species is being used for tanning purposes as shown in Table 3.

### Honeybee species

Swat honey is extremely valuable due to its medicinal properties, high quality, and purity. The beekeeping practices are common in the area because people have been keeping indigenous bees since immemorial times when people kept honeybees in muddy pots in their houses. Therefore, 24 (44%) plant species in the family are reportedly visited by honeybees for the production of honey. The most common plants of the family that were visited by honeybee were *Malus domestica*, *Rosa brunonii*, *Rosa webbiana*, *Rosa chinensis*, *Rosa moschata*, *Rosa water*, *Cydonia oblonga*, *Eriobotrya japonica*, *Prunus armeniaca*, *Prunus persica* and *Pyrus communis*. The collection of honey from wild beehives is an essential food source and also a good source of profit for the local people of the area. Traditional beekeeping in mud pots (locally known as Da Macho Dad) and wood hollows set in the walls of the homes was well-known among the women in the study area. Several professional beekeepers, however, visited the area with their bee wooden boxes during the summer and spring seasons. However, several professional beekeepers also visited the area during summer and spring seasons along with their bee wooden boxes. Although, these masses can be seen on the roadsides and in the orchards. Beekeepers collect honey, which is then sold in various local markets at prices ranging from 800 to 2000 PKR per Kilogram depending on the quality of the honey. Pure honey is sold at a high price, while honey with sugar is sold at a lower price.

### Ornamental

The family is well known for ornamental purposes due to its shiny and beautiful flowers. In the Swat district, about 8 (14%) plants of the family were used for ornamental purposes. The most widely used plant was *Rosa indica* including all varieties commonly used as ornamentals throughout the area. Along with *Rosa* species, *Sorbus aria*, *Spiraea chinensis*, *Spiraea canescens* and *Sorbaria tomentosa* were grown in homes, schools, colleges, hospitals, on the roadside, and other governmental and private organizations for ornamental purposes, as shown in Table 3.

### Minor Uses

Some species are used for minor purposes in the area, such as *Cotoneaster numularia*, which is used for baskets used for a variety of purposes, such as fruit sampling and stocking other items in the houses. *Malus domestica* and *Cotoneaster numularia* are used for walking stick. *Crataegus songarica* used for making mallets and obtaining oils from almond which are used as hair tonic. However, some plants of the family were also used for naming purpose in the area such as Khobani tror (*Prunus armeniaca*), and Gulab (*Rose*) while some were also used for the names of places such as tangai Chena (*Pyrus pashia*).

Table 3. Ethnobotanical information of Rosaceae family plants of district Swat

Scientific name	Habitat	Part used	Method of use	Medicinal uses	Other uses
<i>Agrimonia eupatoria</i> L.	Herb	Shoot	Decoction	Used for urinary track	Grazing fodder for sheep and goats
<i>Cotoneaster affinis</i> Lindl.	Shrub	-	-	-	Used as fuel and hedge
<i>Cotoneaster integerrimus</i> Medic.	Shrub	-	Toxic	-	Used as fuel and hedge
<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	Shrub	Stem bark	Stem and root	Used as hemostatic and root used for hepatitis	Fencing, thatching and sheltering roof.
<i>Cotoneaster minutus</i> Klotz	Shrub	-	-	-	Fruit edible, used as fuel and hedge
<i>Cotoneaster numularia</i> Fisch. and Mey.	Shrub	Fruit	Direct	Used as astringent and expectorant	Fencing, thatching and sheltering roof.
<i>Crataegus oxycantha</i> L.	Tree	Fruit	Direct	Heart tonic	Fruit edible
<i>Crataegus songarica</i> C. Koch	Tree	Fruits and leaves	Direct and powder	Fruit used as cardio tonic.	Wood used for making agricultural tools, mallets, fuel wood and leaves are used for fodder.
<i>Cydonia oblonga</i> Mill.	Tree	Fruit	Direct	Body tonic	Fruit and fuel wood
<i>Duchesnea indica</i> (Andrews) Focke	Herb	Fruit	Decoction	Fruit is used as tonic and juice is used for eye infections.	Fruit edible, Fodder
<i>Elaeagnus angustifolia</i> L.	Tree	Shoot	Powder	Used for headache, Heart burning and skin infections	
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Tree	Leaves	Decoction	Used for asthma	Wood used as fuel and fruit
<i>Filipendula ulmonia</i> (L.) Maxim	Herb	Shoot	Powder or decoction	Used for stomach problem	-
<i>Fragaria indica</i> Andrew.	Herb	Shoot	Decoction	digestive upsets	Edible fruit
<i>Fragaria nubicola</i> (Hook.cf.) Lindl. ex Lacaíta	Herb	Leaves, fruit, flower and roots	Decoction	Used to relieve constipation.	Wood is used as fuel. Leaves are used as fodder for cattle.
<i>Fragaria vesca</i> L.	Herb	Fruit	Direct	Heart problem.	Fodder
<i>Geum alatum</i> Wall. ex Hook. f.	Herb	Shoot	Powder	Diabetes, blood purifier, help to reduce inflammation.	Fodder
<i>Geum urbanum</i> L.	Herb	Shoot	Powder	Used for piles	Fodder
<i>Malus baccata</i> (L.) Borkh.	Tree	Fruit	Direct	Headache	Fuel wood, fodder and fruits
<i>Malus domestica</i> Borkh.	Tree	Fruit	Direct or Juice	Used for blood problems	Walking sticks, fuel wood and agriculture tools

<i>Potentilla argentea</i> L.	Herb	Shoot	Decoction	Used for digestive problem	Fodder for goat and sheep
<i>Potentilla atrosanguinea</i> G.Lodd. ex D. Don.	Herb	Shoot	Juice	Used to control Diarrhea, Mildly painful menstruation	Fodder for goat and sheep
<i>Potentilla gerardiana</i> Lindl. ex Lehm.	Herb	Root	Powder	Used as blood purifier, herbal cosmetic internally as astringent.	-
<i>Potentilla monanthes</i> Lindl.	Herb	Shoot	Powder	Swelling of throat and mouth, body tonic	-
<i>Potentilla nepalensis</i> Hook.	Herb	Shoot	Powder	used for ulcer	Used as Miswak
<i>Potentilla reptans</i> L.	Herb	Shoot	Powder	Used for diarrhea	-
<i>Potentilla reptaris</i> L.	Herb	Shoot	Powder	Used for diarrhea	Fodder
<i>Potentilla supina</i> L.	Herb	Shoot	Decoction	Blood purifier, wounds and burning of feet	-
<i>Poterium polygonum</i> Waldst and Kit.	Herb	Shoot	Powder and decoction	Used as herbal cosmetic, improve skin, herbal tea is mild diuretic.	Salad
<i>Prunus amygdalus</i> Batsch.	Tree	Nut	Direct	used in neural disorders and a good source of vitamin E	A good gesture of hospitality and fuel wood
<i>Prunus armeniaca</i> L.	Tree	Gum and Bark	Direct and decoction	Gum anticancer and bark used for hepatitis	Fuel wood, fruit and agricultural tools
<i>Prunus avium</i> (L.) L.	Tree	Fruit or Juice	Direct	Kidney stone	Thatching, fruits and fuel wood
<i>Prunus cerasifera</i> Ehrh.	Tree	Fruit	Direct	Its fruit is good source of vitamins C and B	Fuel wood, fodder and fruits
<i>Prunus cerasoides</i> D. Don	Tree	Fruit	Direct or Juice	Kidney stones	Fruit edible, stem is used as fuel wood.
<i>Prunus cornuta</i> (Wall. ex Royle) Steud.	Tree	-	-	-	Agricultural tool making, milk curding and fuel wood
<i>Prunus domestica</i> L.	Tree	Fruit	Direct or juice	Its fruit is a good source of vitamin C	Used fuel wood, honeybee, and fruits
<i>Prunus persica</i> (L.) Batsch	Tree	Fruit and leaves	Direct or Juice	Fruits rich of vitamin A and C and leaves used as insecticide for lice	leaves used as fodder and wood used as fuel
<i>Pyrus communis</i> L.	Tree	Fruit	Direct	Digestive problems, also contains vitamin C and K	leaves used as fodder and wood used as fuel



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<i>Pyrus pashia</i> Buch.-Ham. ex D. Don	Tree	Fruit and leaves	Direct	Fruits contains high sugar and leaves used for hair color	Fruits edible only when fully ripe, also eaten by jackals, wood is used as fuel, honeybee species.
<i>Robus fruticosus</i> L.	Climbing Shrub	Root and fruit	Direct	Root used for hepatitis and diarrhea	Fruit, fodder, fencing and hedges.
<i>Rosa brunonii</i> Lindl.	Climbing Shrub	Fruit	Direct	Used as blood purifier	Ornamental and fencing
<i>Rosa chinensis</i> Jacq.	Shrub	Fruit	Direct	Anti-microbial	Ornamental and fencing
<i>Rosa moschata</i> Herrm.	Shrub	Flower	Juice	Used for curing stomach	Ornamental and fencing
<i>Rosa water</i> Gadzh.	Shrub	Flower	Juice	Used for beauty and making Arqi Gulab	Ornamental
<i>Rosa webbiana</i> Wall. ex Royle	Climbing Shrub	Fruits and pastels	Decoction and powder	Used to treat asthma and stomach	Ornamental and fencing
<i>Rubus ellipticus</i> Sm.	Climbing Shrub	Fruit	Juice	Fruit is edible and is useful for removal of kidney stone	Plants are grown for making hedges.
<i>Rubus niveus</i> Thunb.	Climbing Shrub	Fruit	Direct	Antioxidant	Fruits edible, hedge and fencing.
<i>Rubus sanctus</i> Schreb.	Climbing Shrub	Leaves	Powder	Wound healing	Fruit, edible, hedge and fencing
<i>Rubus ulmifolius</i> Schott	Climbing Shrub	-	-	-	Fruit, fencing and hedges.
<i>Sanguisorba filiformis</i> (Hook. f.) Hand.-Mazz.	Herb	-	-	-	Fodder for goats.
<i>Sibbaldia procumbens</i> L.	Herb	-	-	-	-
<i>Sorbaria tomentosa</i> (Lindl.) Rehder	Shrub	Leaves	Powder and decoction	Used in asthma	Used as fuel and ornamental
<i>Sorbus aria</i> L.	Tree	-	-	-	Raw snacks, timber leaves used as fodder and ornamental tree
<i>Spiraea canescens</i> D. Don	Shrub	-	-	Cause purgation if eaten in excess	Walking stalk, Fodder for goats.
<i>Spiraea chinensis</i> Maxim.	Shrub	Fruit	Direct or powder	Used in delivery cases	Ornamental

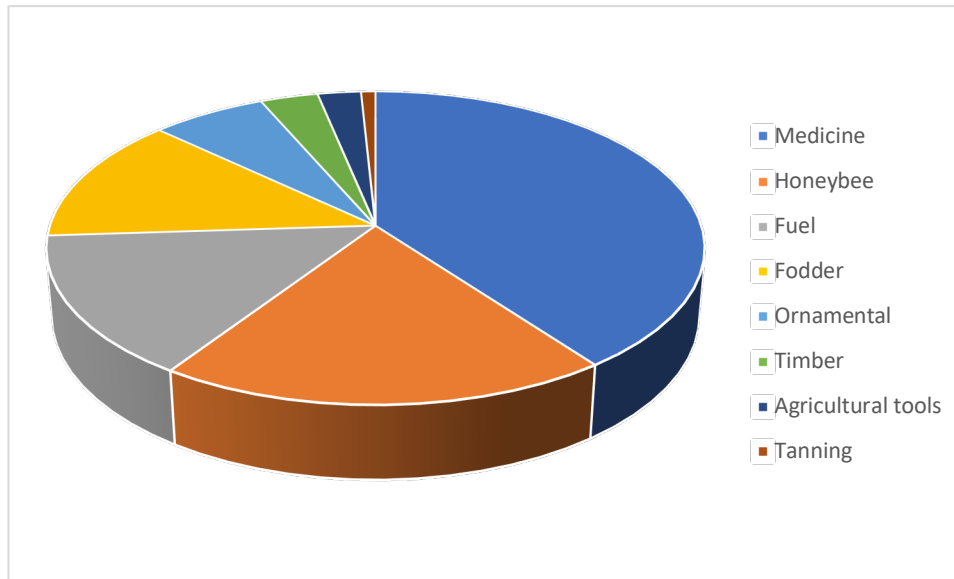


Figure 2. Ethnobotanical used of plants

## Discussion

Rosaceae is one of the main plant families from an economic point of view, due to the production and consumption of its various fruits, such as apple, pear, plum, and peach among others. Furthermore, with ornamental species widely used throughout the world, as is the case with roses (Souza, Lorenzi, 2008). The present study documented about 55 plants species that were ethnobotanically used throughout the Swat region. The reported plants in this study, summarized in Table 3, show that the Rosaceae family is known for its beautiful species of economic importance. The family is also an excellent source of medicines, fuel wood, commercial fruits, fodder, and thatching material which is also used for agricultural tools, furniture, fencing, and ornamental purposes. The results of current study are similar with that of (Janick 2005). The family has great importance among the local people, not only in Swat but throughout the world.

The current study documented the traditional importance of the family among the Swat district's local population. The collected data showed that *Prunus armeniaca*, *Prunus persica*, *Prunus domestica*, *Pyrus communis* and *Malus domestica* are the economically more important fruiting plants of the study area. Along with the fruit, the wood of these species is used as fuel wood, and their leaves are used as fodder. Most flowers of these species have been visited by honeybees for the production of honey. This finding is supported by (Sher *et al.*, 2010, Hamayun, 2005, Nabi *et al.*, 2015). *Malus domestica* is widely cultivated among the other fruiting plants of the family in the area due to its high demand in the market and ability to be stored for a long time. This statement is supported by (Sher *et al.*, 2010). It is noteworthy that (Mendes *et al.* 1999) and Barata-Silva (2005) reported that the infusion or decoction of peach leaves is popularly used for headaches, flu, and hypotensive. While the current study found that *Prunus persica* fruit is high in vitamins A and C and that its leaves can be used as a lice insecticide. The current study's findings are similar to those of (Hamayun *et al.* 2005), who documented that apples and apricots were considered the best fruits with high demand in local markets.

Most of the Rosaceae plants are used as medicine, fuel wood, thatching, fencing, food, agriculture tools, honeybee species, and fodder. (Hamayun *et al.* 2005) agree with this finding. *Rosa webbiana*, *Rubus ellipticus*, *Rubus fruticosus*, *Cotoneaster nummularia* and *Cotoneaster microphyllus* were used as fencing, fodder, for the honeybee, sheltering roof and ornamental purposes (Sher and Mohammad, 2010, Ibrar *et al.*, 2011, Ali *et al.*, 2011). While these species, including *Duchesnea indica* also used as a tonics, for eye infections, hepatitis, diarrhea and asthma and also its fruit is edible, *Crataegus oxycantha* is used as a heart tonic, and the fruit is edible (Sher and Mohammad, 2010); *Fragaria indica* is used to treat digestive upsets, and the fruit is edible; and *Rosa moschata* is used as an ornamental, honeybee, and fencing plant. (Ali *et al.* 2011) and Sher and Mohammad (2010) both reported the same species from Malam Jabba, Swat. *Prunus amygdalus* is used as a tonic and for neurological disorders. It is also used as a good gesture of hospitality. *Malus domestica* is known for its taste and aroma. It is widely used for blood problems, and as a nutrient (Kishawar *et al.* 2018) support this statement. (Ilyas *et al.* 2013) reported about 15 similar plants from the rose family with similar uses. (Khan *et al.* 2015) described *Duchesnea indica* as a treatment for kidney stones, venereal disease, and as an anthelmintic. (Mushtaq *et al.*, 2014) mentioned *Duchesnea indica*

used for mental disorders, sexual weakness, while our study reported that this species is used as a tonic, its fruit juice is used for eye infections, and it is also as fodder for cattle. (Sher *et al.* 2010) reported that *Fragaria nubicola* used for heart diseases, *Geum alatum* used as diabetes, blood purifier, and help to reduce inflammation, *Cotoneaster microphylla* used as a blood purifier and is also better for weight loss, *Potentilla reptans* Used against to kill microorganism. This study, on the other hand, suggests that *Duchesnea indica* species are used to relieve constipation and as honeybee species and fodder, *Geum elatum* is used as an anti-diabetic and as fodder, *Cotoneaster microphyllus* is used as a hemostat and its root is used for hepatitis, and *Potentilla reptans* is used for diarrhea. *Rosa webbiana* used for stomach disorders, *Eriobotrya japonica* used as a source of fuel, and shoot is used as a thatching material (Nabi *et al.*, 2015). The present study suggests that *Rosa webbiana* used as a blood purifier and *Eriobotrya japonica* used for asthma. *Spiraea chinensis* used in the delivery case (Sher and Mohammad 2010). *Malus pumila* leaves were being used for skin boils, hair loss, and refrigerants. Its fruit is also used as a tonic and spermatogenic. *Rubus fruticosus* leaves are utilized for skin boils, wounds and as anti-inflammatory. While was fruit used as a bone tonic and root used for abdominal disorders (Shah *et al.* 2016) while study present study says *Malus domestica* used for blood problems and *Rubus fruticosus* used for hepatitis and diarrhea, *Prunus cornuata* used as a digestive agent (Khan *et al.*, 2013) while this study showed that there are no medicinal uses of *Prunus cornuata*.

### **Economical important fruits plants of the family in Swat**

The family Rosaceae consists of well-known and pretty species of economically important fruits. In the study area, fruits of the family were highly used. Fruits from nine species collected in the wild and nine species widely cultivated in the area were among them. According to Swat's agriculture department, a total of 13,000 hectares were used for the cultivation of various fruits, yielding up to 100,000 metric tons. Every year, the valley supplies more than 100,000 tons of fruit to the national market, generating an economic return of Rs 1,430 million PKR. Therefore, local people and land-owners broadly cultivated various plants of the family due to their commercial value and several varieties. Although there are a high number of agriculture trading markets in Pakistan, while two or three are found in Swat district where people trade their agricultural resources. The value of agricultural resources in Swat's local market is frequently less expensive than that found in Pakistan's major cities.

**Orchards *Malus pumila* covered about 3000 hectares, with 28 types of apple** grown in the district. Among them, red delicious and golden sweet were prominently cultivated in the area, which are traded across Pakistan, but also have ample trade with international markets. Apple fruits have great commercial potential and broad demand in the market due to their ability to store for long a time, even for one season, followed by *Prunus persica* which provides almost 8 to 9 varieties of fruits from late May to September. Therefore, it is highly cultivated fruit due to its market value. It is not stored for long that affects the marketing value but ample varieties containing different ripening period overcomes its storage deficiency. *Prunus domestica* is commonly cultivated in the area due to its good commercial potential. There are almost 3 to 4 varieties grown in the area, but currently the most commonly grown variety is Red Beauty. Its fruit has not been stored for a long time but still has some storage ability, which gives it an average demand in the market. This fruit is being traded among the different cities of the country. Plum is the important fruit after peach in terms of area and production in Swat. *After apple, peach, and plum, Prunus armeniaca is Swat's fourth most important fruit crop.* It is cultivated in many areas of Swat. Several land-holders have grown orchards of apricot, while some people have grown one or more trees in their fields, homes, and gardens. Apricot is an essential source of income for the people of Swat because they are trading both fresh and dried forms throughout the district as well as across the country, *Pyrus communis* is commonly growing fruit in the study area because its production per hectare is higher than that of other fruits growing in the area. Though these fruits still have a good market value, more should be done by introducing improved varieties. *Prunus avium* is an important fruit in Swat for consumption and export. The cultivation of this fruiting plant maximizes promptly as the rearing fields improve in the area. The high quality of has an excellent market value. *Prunus amygdalus* nuts are one of the most used nuts in the area. Almond consumption is particularly high in the winter, as it is in other parts of the country. But Swat has rare orchards or even a few trees. However, because consumption exceeds production, almonds must be imported from other parts of the country. Almonds in Swat range in price from 600 to 1300 PKR per Kg, depending on quality and cleanliness. People in the area used almond for a variety of purposes, including pudding, cake, cookies, pastries, halwa, and so on, while most people ate it raw. There are no large orchards of *Cydonia oblonga* or *Eriobotrya japonica* in Swat district. People grow these as ornamentals; they are almost exclusively found in homes, parks, and gardens.

There is a high and growing demand for fruits in Swat, but the people of the area have been facing various problems in being able to meet this demand because the fruit-growing regions are inaccessible. The area's transportation facilities are inadequate, and the transportation costs are prohibitively expensive. Furthermore, there are no proper

methods for storing, packaging, or branding. Moreover, the link between markets is very weak, and producer participation in merchandising is limited. Local people in the study area are not aware of marketing requirements in regard to quality and quantity. Hence, local governments need to provide good quality planting material, grafting techniques, transportation, orchard management tools, appropriate technological facilities, farmers' approaches to assemblage on the marketplace, market postulates, and market values, etc.

## Conclusion

The family Rosaceae has been used ethnobotanically throughout the study area. The field work for the current study was carried out from 2021 to 2022. A total of 55 species under 21 genera belonging to the family Rosaceae were collected and identified. It is the most varied and cosmopolitan family of flowering plants. Many of its species have been used ethnobotanically. Now-a-day, the growing need for more economic benefits has determined scientific interest in the Rosacea family. Based on the data gathered, it is concluded that the family possesses a large number of valuable plants that are used by various ethnic communities for a variety of purposes, including medicinal uses, fuel wood, fodder, and forage, as well as timber and ornamental purposes. In the present study, the ethnobotanical uses of plants belonging to the Rosaceae family were summarized. On the basis of the data collected in this study, it is evident that the family Rosaceae consists of a broad range of ethnobotanically important plants, while some plants have the potential to be used against various incurable diseases. The present study may be a preliminary contribution to this area by using standard research methods, focusing on ethnobotanical and local uses. This information will be useful to researchers when collecting and identifying plants for their research.

## Declarations

**Ethics approval and consent to participate:** The author is a native of the study area where the research was carried out, and the questionnaire was answered by the healers and local people with their own will and consent to help their own community. Also, the verbal informed consent was obtained from each informant before interviews. The interview procedure was explained to each in their local language. Other things were not applicable.

**Consent for publication:** All persons shown in images agreed to have their pictures taken and published..

**Consent for publication:** Not applicable.

**Competing interests:** The author declares that he is the sole author and has no conflict of interest.

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**Author contributions:** I (Mr. Shujat Ali) designed the study, collected and analyzed the data, and drafted the manuscript. I designed the study, revised and finalized the manuscript.

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Appendix - Some Picture during field work



Appendix Figure 1: A, B, C, D: Fieldwork meeting with local people





Appendix Figure 2: A, B, C: Fuel wood of *Prunus* and *Pyrus* spp, Fig D: *Pyrus* fruits





Appendix Figure 3: A: field work, Fig B: Meeting with 90-year-old Amir Zada, Fig C: Meeting with local Hakim