Traditional Use of Medicinal Plants in Afghanistan with Respect to the Kabul and Parwan Regions

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Abdul Ghani Karimi

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LIST OF ABBREVIATIONS

BA	Bark
Be	Beverage
BPH	Benign prostatic hyperplasia
BU	Bulb
Ch	Chewing
CNS	Central nervous system
Co	Cooked
Cv	Covering
CX	Calyx
De	Decoction
Dp	Drop
DPPH	Diphenyl-β-picrylhydrazyl
Dy	Dry
EO	Essential oil
FL	Flower
FO	Fixed oil
FQ	Frequency
Fr	Fresh
FS	Fruit septa
FU	Fruit
GI	Gastrointestinal
Gr	Grinding
GU	Gum
HE	Herb
HU	Husk
I	Imported
IF	Inflorescences
In	Infusion
Ja	Jam
Ju	Juice
LE	Leaves
Mc	Maceration

MRSA	Methicillin-resistant *Staphylococcus aureus*
N	Native
Pa	Paste
PDR	Physician disk reference
PE	Peel
Pi	Pill
Po	Poultice
PT	Petioles
Pw	Powder
Ra	Raw
RE	Resin
RH	Rhizome
RO	Roots
Rs	Roast
RT	Rootlets
RTI	Respiratory tract infections
Ru	Rub
SA	Sap
SE	Seeds
SHBG	Sex hormone-binding globulin
Sm	Smoking
SM	Stem
So	Solution
ST	Stigmata
TA	Tall
Tb	Teeth brush
TE	Tendril
Ti	Tincture
TU	Tuber
UTI	Urinary tract infections
WHO	World Health Organization

ZUSAMMENFASSUNG

Afghanistan ist ein gebirgiges Land in der Mitte des eurasischen Kontinents, hat eine reiche Flora und war seit der Antike immer das Gebiet von Kontroversen und Konflikten zwischen den antiken Reichen. Dieser Hintergrund führte zu einer reichen Kultur und zu vielfältigen Traditionen, welche die Verwendung von Arzneipflanzen beinhalten. Die Flora des Landes ist jedoch relativ schlecht erforscht und die Untersuchungen an Arzneipflanzen, die in der traditionellen Medizin verwendet werden, sind bisher unzureichend. Mit der nun vorgestellten ethnobotanische Studie soll die Verwendung von Arzneipflanzen in den Provinzen Kabul und Parwan dokumentiert werden. Für die Untersuchungen wurden ethnobotanische Daten durch Interviews mit sachkundigen Einheimischen unter Verwendung strukturierter Fragebögen gesammelt. Parallel dazu wurden Herbarbelege im Herbarium der Fakultät für Pharmazie der Universität Kabul archiviert. Die Ergebnisse dieser Umfrage zeigen, dass im Untersuchungsgebiet insgesamt 270 Arzneipflanzen-Arten aus 76 Familien verwendet wurden. Am häufigsten vertreten waren Mitglieder der Pflanzenfamilien Asteraceae (10%), Fabaceae, Lamiaceae (jeweils > 8%), Apiaceae (8%), Rosaceae (> 7%), Solanaceae, Poaceae und Brassicaceae (jeweils > 4%). Von den dokumentierten Pflanzen wurden ca. 32% (87 Arten) sehr häufig verwendet, zitiert von mehr als 10 Informanten; 21% (56 Arten) wurden häufig verwendet (5-10-mal erfasst) und 47% (127 Arten) wurden weniger häufig verwendet (4-6-mal erfasst). Es wurde festgestellt, dass *Cichorium intybus* L., *Achillea wilhelmsii* K. Koch, *Foeniculum vulgare* Mill., *Althaea officinalis* L., *Plantago major* L., *Berberis integerrima* Bunge, *Descurainia sophia* (L.) Webb ex Prantl, *Glycyrrhiza glabra* L., *Artemisia absinthium* L., *Mentha longifolia* (L.) L., *Artemisia alba* Turra, *Anethum graveolens* L., *Alhagi pseudalhagi* (M. Bieb.) Desv., *Prunus cerasus* L., *Trachyspermum ammi* (L.) Sprague, *Urtica dioica* L., *Artemisia sieberi* Besser, *Ephedra gerardiana* Wall. Ex Klotzsch & Garcke, *Malva neglecta* Wallr., *Juglans regia* L., *Peganum harmala* L., *Borago officinalis* L., *Hymenocrater sessilifolius* Benth. und *Levisticum officinale* W.D.J.Koch die am häufigsten verwendeten Arten in der Region sind. Diese Arzneipflanzen werden hauptsächlich zur Therapie von Magen-Darm-Erkrankungen (> 28%), Muskel-Skelett-Erkrankungen (> 21%), Herz-Kreislauf-Erkrankungen (> 12%), Harnwegserkrankungen (> 10%) und Atemwegserkrankungen (10%) verwendet. Die häufigsten Darreichungsformen waren Infusionen (21%), Pulver (20%), Abkochungen (18%), Frischverzehr (11%) und Mazeration (7%).

Diese Studie zeigt, dass der Einsatz von Arzneipflanzen zur Behandlung verschiedener, typischerweise geringfügiger Erkrankungen, im untersuchten Gebiet recht häufig praktiziert wird. Auch wenn einige Heilpflanzen im gesamten Gebiet häufig verwendet werden, haben sie jedoch regional unterschiedliche Verwendungszwecke. Einige der von unseren Informanten zitierten Pflanzen haben bisher keine bibliographischen Angaben zur traditionellen medizinischen Verwendung.

SUMMARY

Afghanistan is a mountainous country located in the middle of the Eurasiatic continent. It has a rich flora and has always been an area of controversy and conflict between different emperors since ancient times. This background resulted in rich culture and traditions that include the use of medicinal plants. However, the flora of the country is not well investigated and research on medicinal plants used in traditional medicine is limited until now. The now-presented ethnobotanical study has been designed to document the use of medicinal plants in the Kabul and Parwan provinces. Field research was conducted by collecting ethnobotanical data via interviews with knowledgeable local people using structured questionnaires. Herbarium specimens were deposited in the herbarium of the Faculty of Pharmacy, Kabul University. The results of this survey show that a total of 270 medicinal plant species belonging to 76 families were used in the study area. Most of these species were members of the plant families Asteraceae (10%), Fabaceae, Lamiaceae (>8% each), Apiaceae (8%), Rosaceae (>7%), Solanaceae, Poaceae, and Brassicaceae (4% each). Out of all the plants we reported, approximately 32% (87 species) were very frequently used, cited by more than 10 informants; 21% (56 species) were frequently used (recorded 5-10 times) and 47% (127 species) were less frequent use (recorded 4–6 times). It was found that *Cichorium intybus* L., *Achillea wilhelmsii* K. Koch, *Foeniculum vulgare* Mill., *Althaea officinalis* L., *Plantago major* L., *Berberis integerrima* Bunge, *Descurainia sophia* (L.) Webb ex Prantl, *Glycyrrhiza glabra* L., *Artemisia absinthium* L., *Mentha longifolia* (L.) L., *Artemisia alba* Turra, *Anethum graveolens* L., *Alhagi pseudalhagi* (M. Bieb.) Desv., *Prunus cerasus* L., *Trachyspermum ammi* (L.) Sprague, *Urtica dioica* L., *Artemisia sieberi* Besser, *Ephedra gerardiana* Wall. ex Klotzsch & Garcke, *Malva neglecta* Wallr., *Juglans regia* L., *Peganum harmala* L., *Borago officinalis* L., *Hymenocrater sessilifolius* Benth., and *Levisticum officinale* W.D.J.Koch, were the most often used species in the area. These medicinal plants were mainly used for the management of gastrointestinal diseases (> 28%), muscle-skeletal problems (> 21%), cardiovascular diseases (> 12%), urinary tract diseases (> 10%), and respiratory tract diseases (10%). The most frequent forms of administration were infusions (21%), powders (20%), decoctions (18%), fresh consumption (11%), and maceration (7%). This study reveals that the utilization of medicinal plants is frequently practiced for the treatment of different, typically minor disorders, in the area of interest. Even though some medicinal plants are commonly used throughout the area, they own regionally different uses. In the meantime, some of the plants cited by our informants have no bibliographic record in terms of traditional medicinal use until now.

1 INTRODUCTION

1.1 General

For many centuries, treatment with medicinal plants was nearly the only resource available for numerous ethnic groups, and nowadays, plants are still used in traditional medicine to treat or prevent diseases (Gasparetto, et al., 2012). Studies on the ethnomedicinal uses of medicinal plants by local people are very important because they may lead to the discovery of new drugs of natural origin. The documentation of traditional knowledge of medicinal plants has provided many important drugs that are used in modern medicine (Heinrich, et al., 2013).

More than 25% of currently available medicines in the markets are derived from medicinal plants. The use of plants in order to treat diseases and relieve physical suffering has started from the earliest times of mankind's history (Sargın, et al., 2013). Nowadays, the use of medicinal plants for the treatment of ailments is still important for humans, especially if they have restricted access to modern medicines.

Ethnobotany is focused on the study of indigenous knowledge of how plants are perceived, used, and managed. Many ethnobotanical studies are being conducted in Asian countries, searching for a better knowledge of traditional medicines, and better scientific identification of the plants. Ethnopharmacology is related to the observation, description, and experimental investigation of indigenous drugs and their biological activities (Heinrich & Gibbons, 2001). Furthermore, it combines information acquired from people that use medicinal plants (traditional communities and experts) with chemical and pharmacological studies, allowing the formulation of hypotheses about the pharmacological activities and compounds responsible for the reported therapeutic effects (Bruhn & Holmstedt, 1981). The discovery and investigation of medicinal plants are of huge relevance, even for well-developed countries. For example, the emergence of resistance to antibacterial agents is a persuasive concern for human health. Therefore, new drugs to combat this problem are in great demand (Coates, et al., 2002). A detailed investigation and documentation of medicinal plants used by local inhabitants and ethnopharmacological evaluation to verify their efficacy and safety can lead to the development of important herbal drugs or the isolation of compounds of therapeutic value.

Afghanistan is a mountainous country located in the middle of the Eurasiatic continent between latitude 30º25’ and 38º31’ north and longitude 60º45’ and 72º east. It is bounded by Turkmenistan, Uzbekistan, and Tajikistan in the North, China to the Northeast, Pakistan to the

East and South, and Iran to the West (Figure 1). The total area of Afghanistan amounts to nearly 635,000 square kilometers. A large part of Afghanistan lies in the west and central Asiatic floristic region. The southern lowland belongs to the African-Indian Desert region, and the eastern part belongs to the Sino-Japanese region (Kitamura, 1960). Due to its geographical situation, and edaphic and climatic conditions, the country has a rich flora out of which a great number of plant species are used in traditional medicine (Younos, et al., 1987). As mentioned above, the flora of Afghanistan, due to its geographical position in Central Asia and different climatic, topographic, and edaphic factors (geodiversity), is very diverse. According to recently published literature, Afghanistan is one of the richest countries in terms of plant diversity in a mainly arid zone having an estimated number of 5,400 vascular plant species. The number of described plant taxa is 4826, and the endemism ratio is 24% (Breckle, et al., 2013).

Figure 1 *Map of Afghanistan (Anon., 2021).*

Traditional ethnobotanical knowledge and the prevalence of medicinal plants in Afghanistan have poorly been investigated by some authors (Volk, 1955a); (Volk, 1961b); (Younos, et al., 1987); (Davis, et al., 1995); (Kassam, et al., 2010); (Jeppesen, et al., 2012); (Karimi, 2016);

(Keusgen, et al., 2020), and by Karimi, et al. (2019). A further report has been published by Amini & Hamdam (2017), but the data were not validated. Whether or not, data regarding the number of medicinal plants used in the traditional medicine of Afghanistan diverges. Volk (1955a) reveals that 173 medicinal plant species are commonly used for medicinal purposes in Afghanistan, while Younos, et al. (1987) reported 215 plant species with medicinal potential in the traditional medicine of the country. These numbers own the potential to be enlarged due to the continuing inventory and investigation of yet unidentified medicinal plant species. A detailed investigation and documentation of medicinal plants used in traditional medicine and their ethnopharmacological evaluation to verify their efficacy and safety can lead to the development of invaluable herbal drugs or the isolation of compounds of therapeutic value. On the other hand, much of the traditional knowledge about medicinal plants is being lost with time, either by the lack of studies or by the inadequate use of plant resources by the new generation. So, the documentation of traditional knowledge regarding the use of medicinal plants by local people will preserve valuable traditional knowledge and provide novel information for both future generations and other communities as well as for resource management and conservation.

After a long period, a comprehensive investigation of medicinal plants in Afghanistan began by our research group in 2014 with the German-Afghan cooperation of pharmaceutical faculties supported by DAAD and continues up to the present. In total, information from the whole country was available in more than 11,000 structured questionnaires. In this study, besides recording traditional knowledge about medicinal plants, also general ethnobotanical aspects like the usage of certain plants in indigenous culture for food, medicine, rituals, building, household implements, firewood, pesticides, clothing, shelter, and other purposes are respected.

This dissertation deals with a systematic study of medicinal plants with much emphasis on the inventory of medicinal plants used by inhabitants and the documentation of traditional knowledge regarding medicinal plants in the rural and non-urban settlement areas of Kabul and Parwan provinces. The area has been chosen for this investigation because its inhabitants can represent the country well. The style of living is very traditional, even in Kabul city, because most of the population of Kabul city are internally displaced people who left their regions due to the war and settled in Kabul. Accordingly, the dependence on plants for medicinal purposes is very high. Ghorband valley, which makes up two-thirds of Parwan province, was under the control of Mujahidin and the later Taliban allowing only a very limited exchange with the

Kabul area. All these factors support the preservation of traditional knowledge about medicinal plants in this area.

1.2 A brief overview of climate and plant collecting activities in Afghanistan

Afghanistan has a Mediterranean-type climate except for the high mountains of the eastern part, which fit the monsoon climate. The largest parts of the country have a rainy spring, very hot and dry summer, arid fall, and cold winter with snowfall. The high mountains located in the middle of Afghanistan in the East to West direction are covered with snow which melts in summer and supplies water to the valleys and the arable and agricultural lands. Figure 2 shows the map of the average rainfall and snowfall all around Afghanistan. As seen on the map, the average annual rainfall is highest in the northeastern mountains (dark blue and purple), while the lowest rainfall area is in the Southwest of Afghanistan (orange-red).

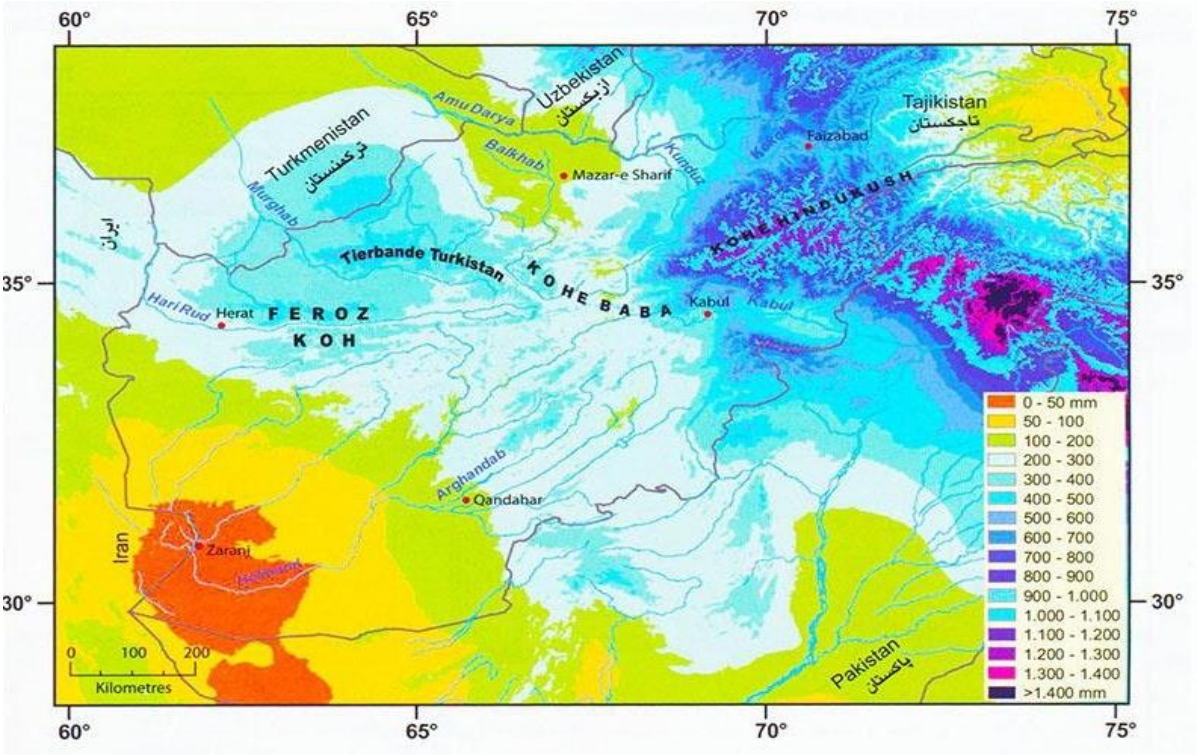


Figure 2 *Average annual precipitation in Afghanistan (University of Nebraska Omaha, n.d.).*

Due to the impact of the arid climate and the damage and destruction caused by grazing animals and herds as well as due to the gathering of plants for fuel (Figure 3), most parts of the country changed to desert-like vegetation (Kitamura, 1960). This may also have caused changes in the distribution of plant species, as well as reductions in the size of plant populations, or even local extinctions of these populations. In addition, many plant species are declining with time due to climate change accompanied by the excessive gathering of plants as fuel as well as for selling

to the market in order to get livelihood with time. These problems significantly affect plant biodiversity, especially in Ghorband valley. Based on the climatic point of view, Afghanistan has been divided into three climatic zones.

Figure 3 *Gathering of plants as fuel in Bamyan.*

1.2.1 Subtropical zone

The subtropical zone occupies the periphery of the country. This zone stretches from 400 m to 1200 m elevation, and the vegetation is mainly like that of deserts. In this zone, rice, wheat, cotton, and melons are extensively cultivated. Pomegranates and grapes are abundant. *Morus alba* L., *Salix babylonica* L., *Schinus molle* L., *Platanus orientalis*, *Pinus halepensis* Mill., *Cupressus sempervirens* L., and *Platycladus orientalis* (L.) Franco (*Thuja orientalis)* are seen as cultivated species in gardens (Kitamura, 1960).

1.2.2 Warm temperate zone

This zone covers the inner concentric area between the peripheral subtropical zone and the central cold temperate zone and is situated at an elevation between 1200 m up to 2400 m. In this zone, trees reach only around 3 to 5 m in height, and the meadow-like vegetation consists of many but scattered species such as *Convolvulus dorycnium* L. subsp. *subhirsutus* (Regel & Schmalh.) Sa'ad (Convolvulaceae), *Alcea (Malva) rhyticarpa* (Trautv.) Iljin (Malvaceae), *Eremurus olgae* Regel (*E. angustifolius* Baker) (Asphodelaceae), *Delphinium zalil* Aitch. & Hemsl., and *D. rugulosum* Boiss. (Ranunculaceae), *Arnebia guttata* subsp. *griffithii* (Boiss.) Sadat (Boraginaceae, Figure 4), *Aphanopleura leptoclada* (Aitch. & Hemsl.) Lipsky (Apiaceae), *Cullen (Psoralea) drupacea* (Bunge) C.H. Stirt. (Fabaceae), *Cephalorhizum oopodum* Popov & Korovin (Plumbaginaceae), *Russowia (Plagiobasis) sogdiana B. Fedtsch.*, *Aster altaicus* Willd., *Cousinia microcarpa* Boiss., *C. olgae* Regel & Schmalh., *C. pectinata* Rech. f. (*C. gillii)*, *C. bipinnata* Boiss., *Lepidolopsis turkestanica* (Regel & Schmalh.) Poljakov

(Chrysanthemum chrysostachys), *Pseudohandelia umbellifera* (Boiss.) Tzvelev *(Chrys. floccosum* Kitam.) (Asteraceae), *Astragalus alopecias* Pall., *A. elatior* Kitam., *A. patentivillosus* Gontsch. (Fabaceae).

Figure 4 *Arnebia afghanica in the Hindu Kush Mountains at an elevation of 2350 m.*

On saline soils, *Artemisia maritima* L. covers the hillside slopes, and *Haloxylon multiflorum* (Moq.) Bunge ex Boiss. or *H. salicornicum* (Moq.) Bunge ex Boiss. the salt marsh depressions of plains. In some parts of this zone, especially near Kabul, such meadow-like vegetation has a different composition where Boraginaceous *Lindelofia (Adelocaryum) anchusoides* (Lindl.) Lehm., *Cynoglossum wallichii* G. Don (*C. glochidiatum)*, *Arnebia (Macrotomia) speciosa* Aitch. & Hemsley, and *Prangos pubularia* (Figure 5), etc. grow.

Figure 5 *Prangos pabularia in the flowering stage.*

While in the region between Pulikhumri, the center of Baghlan province, and Haibak, the center of Samangan province, the dominant species of such meadow-like vegetation are *Aegilops squarrosa* L. and *Hordeum murinum* L. subsp. *leporinum* (Link) Arcang. mixed with *A.*

triuncialis L. and sometimes *A. crassa* Boiss. ex Hohen., *Cousinias*, *Convolvulus dorycnium* subsp. *subhirsutus* (Regel & Schmalh.) Sa'ad, and *Eremurus olgae* Regel.

In Paghman valley along rivulets, different *Rosa* spp. (Figure 6) are seen. Also in a moist area west of Kabul, Cyperaceae meadows are seen composed of *Scirpus* spp., *Eleocharis uniglumis* (Link) Schult. *(E. transcaucasica), Carex pseudofoetida* Kük., *Juncus jaxarticus* V.I.Krecz. & Gontsch., etc. Some more species occur in contrast to the dry areas along roadsides, where *Tribulus terrestris* L., *Zygophyllum spp., Chenopodiaceous Bassia (Panderia) pilosa* (Fisch. & C.A.Mey.) Freitag & G.Kadereit, *B. (Kochia) odontoptera* (Schrenk) Freitag & G.Kadereit, *Salsola foetida* Vest ex Schult., *Atriplex stocksii* (Wight) Boiss. (*A. repens)*, *Halocharis violacea* Bunge, *H. hispida* (Schrenk) Bunge, and other herbs are seen.

Figure 6 *Various Rosa spp. along rivulets in Paghman valley (photo by Karimi, 2019).*

Along the riversides, small trees such as *Elaeagnus angustifolia* L., *Punica granatum* L., *Ficus [carica var.] johannis* Boiss., *Platanus orientalis* L., *Colutea paulsenii* Freyn, and shrubs like *Hippophae rhamnoides L.*, *Lycium ruthenicum* Murray, *Rosa beggeriana* Schrenk, *Myricaria bracteata* Royle (*M. germanica* subsp. *alopeculoides*) and *Nitraria schoberi* L., *Tamarix ramosissima Ledeb. (T. pentandra),* and *T. leptostachya* Bunge often grows locally, or in places with groundwater supply. In areas with sufficient constant water supply, temperate species of trees, shrubs, and mesophytic herbs such as *Crataegus songarica*, *Spiraea brahuica* Boiss. [*var. glaucophylla], Lonicera nummulariifolia* Jaub. & Spach *(L. [arborea* var.] *persica* Jaub. & Spach), *Celtis caucasica* Willd., *Ficus palmata* Roxb., *Rosa beggeriana*, and mesophytic herbs like *Campanula sclerotricha* Boiss. (C. *striata* Boiss.), (*Erythraea*) *Centaurium* spp.,

Datisca cannabina L., *Lindelofia (Adelocaryum) anchusoides*, and *Adiantum capillus-veneris* are seen (Kitamura, 1960).

1.2.3 Cold temperate zone

The middle parts of Afghanistan belong to the cold temperate zone which is located at an elevation between 2400 m to 3600 m (Figure 7). This part of the country is the coldest region in Afghanistan with an average high temperature of only 21°C. The land contains dew and moisture and is situated near the melting snow.

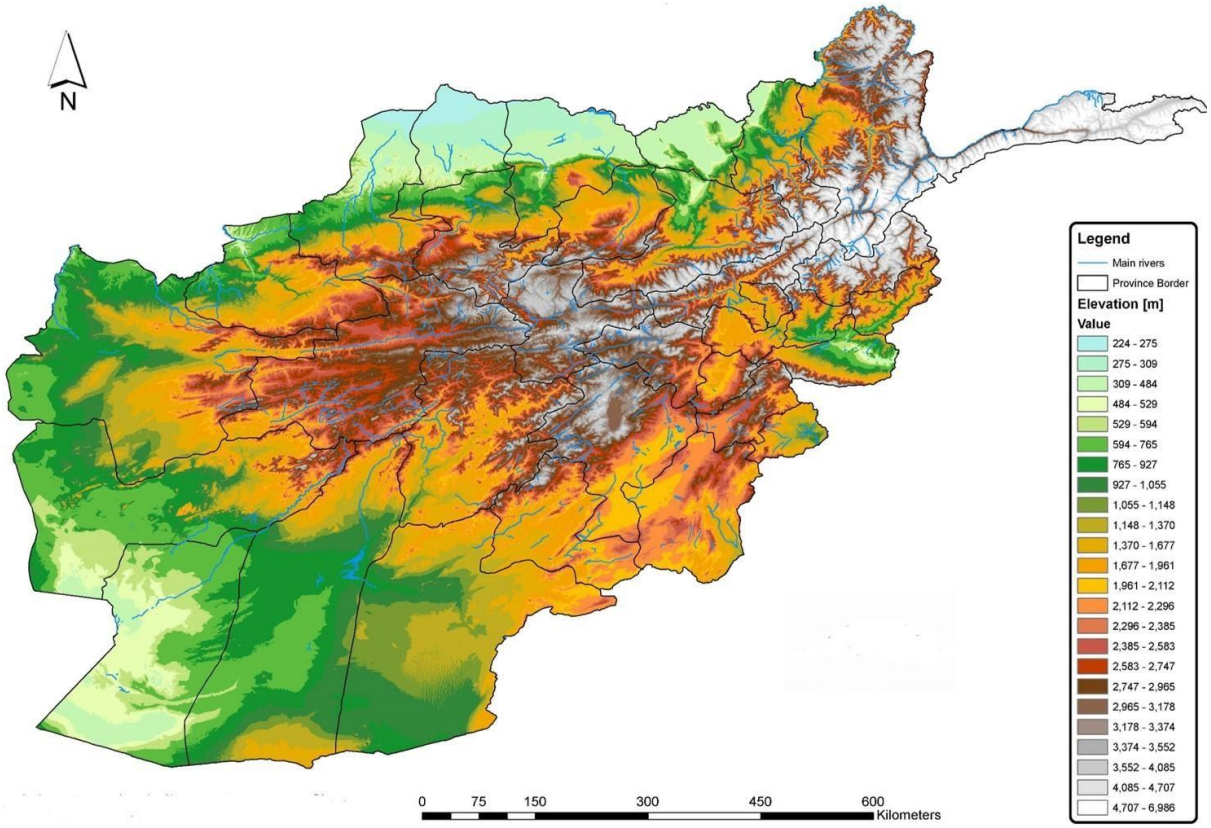


Figure 7 *Map shows the elevation in different parts of Afghanistan (Sanchez, 2009).*

In this zone vegetation is rich, but in general not so dense, and trees are rare (Kitamura, 1960). The climate of central Afghanistan is cold and wet and a few beautiful summer months also happen during the year. For several months of the year, it is warm to hot at temperatures continuously above 25° C, sometimes up to 34°C. Due to warmer temperatures, the best time for traveling is from June to September (WorldData.info, n.d.). In lower parts, *Ferula* spp. (Figure 8), on high mountain slopes *Artemisia maritima* and at rocky places *Melica persica* Kunth *(M. inaequiglumis*), *Tetrapogon villosus* Desf. (*Chloris villosa*), *Andrachne telephioides* L. (*A. rotundifolia*) (Euphorbiaceae), *Plocama* (Gaillonia) *eriantha* (Jaub. & Spach) M. Backlund & Thulin (Rubiaceae); *Arnebia* (Macrotomia) *afghanica, Mattiastrum dielsii*

Bornm., *Trichodesma incanum* (Bunge) A.DC. [var. *stricta*] (Figure 9), *Heliotropium cabulicum* Bunge (Boraginaceae), and *Convolvulus kotschyanus* Boiss. (*C. gonocladus*) are distributed. *Peganum harmala* is abundant along roads in the arid area.

Figure 8 *Ferula sp. in the flowering stage.*

Carum carvi and *Veronica campylopoda* Boiss. are seen in the mountain meadows. *Salix* sp., *Populus nigra* L. [var. *italica*] and *Juglans regia* [subsp. *fallax*] are cultivated species well growing in this zone (Kitamura, 1960).

Figure 9 *Trichodesma incanum in the flowering and pre-flowering stages (photo by Karimi).*

1.2.4 Plants collecting activity

The history of scientific plant-collecting activity in Afghanistan turns back to 1833. Literature shows that more than 120 collectors carried out expeditions to the country. According to literature, **Johann Martin Honigberger,** a native Austrian in Russian attendance, was possibly the first man who collected plants from Afghanistan. In 1833, he collected plants around Kabul and between Kabul and Dara Ghazi Khan. His material remained unidentified for fourteen decades until released by Rechinger, who published some of his collected plants in the "Symbolae Afghanicae" and later on in "Flora Iranica". His materials are located in the “Naturhistorisches Museum Wien”. In 1839, **J.W**. **Grant** collected a few plant species from the north of Bamyan and his materials are located in the Royal Botanic Gardens Kew (Alam, 2009). From 1839 to 1840, the flora of Afghanistan was explored by **William A. Griffith**, an English botanist, who traveled to the country with the English army via Quetta, Pakistan. First, he entered Kandahar and then went to the north and reached Kabul. Also, he visited the northern Hindu Kush and through Koh-i-Baba Bamyan. Besides, he visited Kunar province, Chagasarai, collected plants at Bharowl and Otipore, and came back to Kabul. From June to the end of September 1840, he visited Bamyan again. His collection was distributed in the European herbariums comprising approximately 1273 specimens and was studied by many botanists (Kitamura, 1960; Alam, 2009; Keusgen, et al., 2020). During 1858-1859, **Alexander Bunge,** a member of the Russian Scientific Expedition to Persia and Afghanistan, collected plants in the western parts of Afghanistan. He herborized near Herat during the dry season, in 1859. His specimens were studied by himself and also mainly by E. Bossier and published in the "Flora Orientalis". **James Edward Aitchison** traveled to Afghanistan in 1879 accompanied by the English army. He collected plants from the eastern part of the country and studied his collection and reported his result in the Journal of Linnaean Society (1880). In 1924 and 1926-27, **N. I. Vavilov** with **P. P. Bukinich** traveled to Afghanistan and chiefly studied cultivated plants. From 1923 to 1929, **C. Manger** collected plants specimen from the vicinity of Kabul. These plants were published in the Engler, Botanische Jahrbücher (1934). **G. Kerstan,** a member of the German Hindu Kush Expedition, collected plants mainly from Nuristan in 1935. During 1937-1939, **Walter Koelz** collected plants from the northeastern parts of Afghanistan. Koelz also traveled to many parts of the country including Balkh, Kabul-Kandahar, Garish, Farahm, Herat, and Andkhui. In 1948, **Lennart Edelberg** collected plants in Nuristan, and in 1949 he made a pleasant trip to Deh Kondi. Jointly with **M. Koeie** he also traveled via Kandahar to Herat, Bala Murghab, and Maimana. In the years 1948 to 1951, **H. F. Neubauer** collected

plants from eastern and northern Afghanistan. In 1951, he also had a field trip to Nuristan and visited Asmar to Vaigal and the Pech River. **Otto Heinrich Volk** is another botanist who collected plants of the western Badakhshan and east of the road between Kabul and Gardez during 1950-1953. These collected specimens (ca. 11,000) were studied chiefly by K.-H. Rechinger. **O. Suzuka** was the first Japanese botanist who brought Afghan specimens to Japan. He worked in the Nippon-Shintaku Company in Kyoto City. He traveled to Afghanistan in the spring of 1952 to study *Artemisia maritima;* his materials are located in the Kyoto University Museum. Similarly, in 1954, **S. Iwamura** traveled to Afghanistan and gathered some plants from central Afghanistan.

Figure 10 *Some popular plant collectors of Afghanistan (Alam, 2009).*

In 1955 **H. Kihara, K. Yamashita, S. Kitamura**, and **S. Nakao,** Japanese botanists from Kyoto University, traveled to Afghanistan. They made several field trips to different parts of Afghanistan and studied the plants mainly in the central and eastern parts of the country (Kitamura, 1960). In 1954 **Fernand** collected plants from central Afghanistan. His specimens are housed in the herbarium of Harvard University, Massachusetts, USA, as well as in St. Xavier's College, Maharashtra, Mumbai, India. In 1956 **H. G. Amsel** and Wilfred Thesiger, members of the Deutsch-Afghanische Expedition collected plants housed in the

Naturhistorisches Museum Wien and the Natural History Museum of London, respectively. In 1958, **Henri Pabot** traveled to most provinces of Afghanistan. His collected material is housed at the Conservatoire et Jardin Botanique de la Ville de Genève as well as in the Research Institute of Forests and Rangelands, Iran, Tehran. In 1960 **E. Balley** and *Dunsheath* collected 67 plant specimens from Panjsheer valley (Materials: Royal Botanic Gardens, Kew). From 1966 - 1970, **Helmut Freitag,** a visiting professor at Kabul University, collected more than 8000 plant specimens mainly from the provinces of Kabul, Nangarhar, Kandahar, Ghorband, Maimana, Bamyan, Urgun, Khost, and Ghazni. In 1962 and again in 1969, **Per Wendelbo** and **Ian C. Hedge** traveled to Afghanistan and collected plants mainly from the mountains surrounding Kabul City as well as in Parwan province, Bamyan, and northern Afghanistan. Their specimens are housed in the University of Bergen, Royal Botanic Gardens Edinburgh, Naturhistorisches Museum Wien and Botanical Museum of Oslo, and that of Hedge in Royal Botanic Gardens Edinburgh, Naturhistorisches Museum Wien and Conservatoire et Jardin Botanique de la Ville de Genève. In 1962, 1963, and 1967 **Karl-Heinz Rechinger** traveled to Afghanistan and collected thousands of plants from various parts of Afghanistan. Similarly, **Primer** in 1963, went to Afghanistan and his collection is in the Botanische Staatssammlung, Munich. In 1964, **H. Römer** took part in the plant collection in Afghanistan, and his materials are in the Naturhistorisches Museum Wien, and Botanische Staatssammlung, Munich; In 1964 and 1966 **J.P.W. Furse** is another botanist involved in this activity in the country; his material is located in the Royal Botanic Gardens, Kew, the Royal Botanic Gardens, Edinburgh, and in Naturhistorisches Museum Wien. In 1965, **John David Adam Stanton** had an expedition to Afghanistan, his collected materials are located in the Natural History Museum of London, the Royal Botanic Gardens, Edinburgh, and in the Forest Research Institute, Pakistan Agricultural Research Council, Islamabad. **Wolfgang Frey** (Materials: Eberhard-Karls-Universität, Tübingen), **G. Johnston** (materials location: Royal Botanic Gardens, Kew), and **F. Kazi** (materials location: Naturhistorisches Museum Wien) have also collected plants from Afghanistan. In the 1970ies, **Dieter Podlech** and **Olaf Anders**, two German visiting professors at Kabul University and **D. Dieterle,** played a significant role in the plant collection activity in Afghanistan. Dieter Podlech alone collected more than 10.000 herbarium specimens. In the 1960ies, **Tom F. Hewer** traveled to Afghanistan and collected a large number of plant species mainly from Kandahar, Kabul, and several northern parts of Afghanistan. In 1976, **Fernand Jacquemoud** visited Afghanistan and collected some plant species mainly from Panjsheer valley as well as Bamyan. However, only 50 herbarium specimens are saved in the Conservatoire et Jardin Botanique de la Ville de Genève and the Naturhistorisches Museum

Wien (Alam, 2009). During 1966-1969 and in 1976, **Siegmar-Walter Breckle,** a German visiting professor at Kabul University (within the affiliation program between the Afghan University of Kabul and German Universities Bonn and Cologne) contributed significantly to the exploration of the flora of Afghanistan. He traveled to different parts of Afghanistan and collected more than 4000 herbarium specimens partly with Aichhorn, Amani, Freitag, Lafrai, Podlech, and Sharifi from all around the country. (Details of trips and collaborators given by S.-W. Breckle, personal communication, March 1, 2020). The above-mentioned plant collecting activities mainly focused on the flora of Kabul and its surrounding provinces such as Parwan, Kapisa, Logar, and Wardak as well as Nangarhar and Kunar in the east and Baghlan and Badakhshan (Wakhan) in the north and northwest, respectively. The approximate number of plant species collected per 100 Km^2 from the different parts of Afghanistan is shown in Figure 11. The map reveals that the lowest attention was paid to the flora of Jozjan, Sar-e-Pul, Ghor, Urozgan, Helmand, and Nimroz provinces.

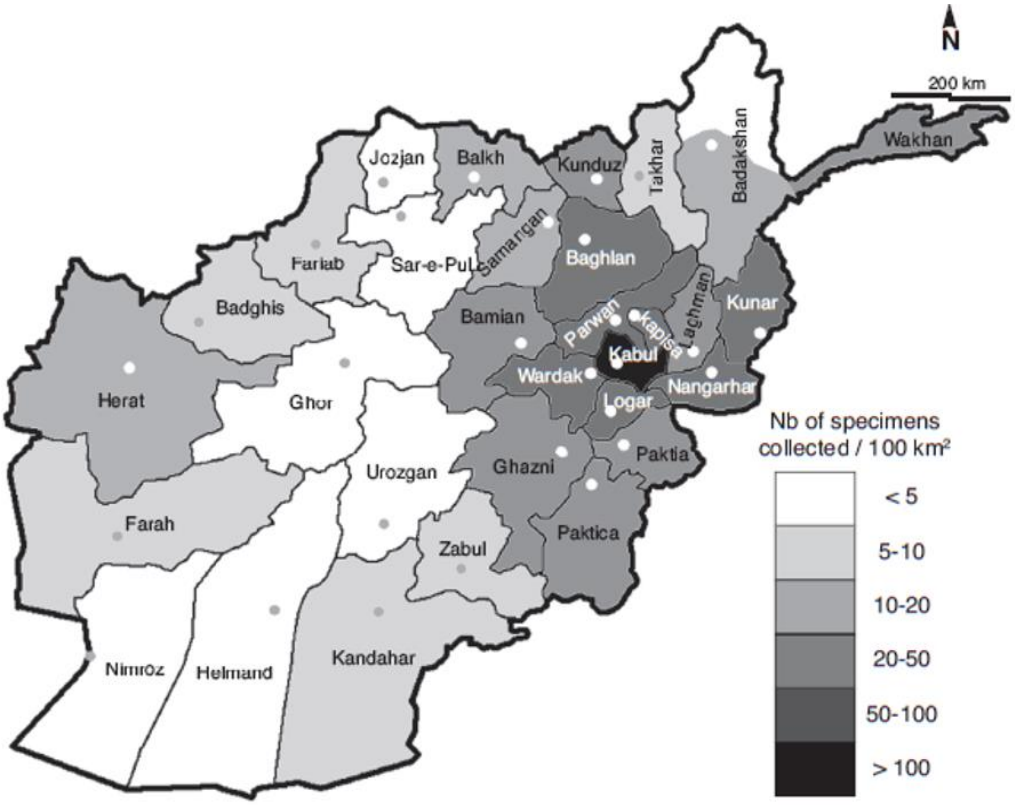


Figure 11 *The number of plants collected from the various parts of Afghanistan (Alam, 2011).*

According to the report by Alam (2009), approximately all of the collected plant specimens are kept in various herbariums around the world (Table 1). These collections represent the rich diversity of plants in Afghanistan and provide valuable information regarding the flora of the country.

Table 1 *Museums and herbaria housing conserved plant specimens of Afghanistan.*

#	Name of the Museum	Country
1	Harvard University, Massachusetts, U. S. A.	U. S. A.
2	Botanischer Garten und Botanisches Museum Berlin-Dahlem	Germany
3	University of Bergen	Norway
4	St. Xavier's College, Maharashtra, Mumbai,	India
5	Indian Council of Forestry Research and Education	Uttar Pradesh, India
6	Natural History Museum of London	United Kingdom
7	University of Copenhagen	Denmark
8	Botanical Survey of India, Kolkata	India
9	Royal Botanic Gardens of Edinburgh	United Kingdom
10	Conservatoire et Jardin botaniques de la Ville de Genève	Switzerland
11	University of Helsinki, Helsinki	Finland
12	Martin-Luther-Universität Halle	Germany
13	Royal Botanic Gardens, Kew	England
14	The University of Kabul, Faculty of Biology	Afghanistan
15	Kyoto University, Kyoto	Japan
16	National Herbarium Nederland, Leiden University, Leiden	Holland
17	V. L. Komarov Botanical Institute, Saint-Petersburg	Russian Federation
18	Botanische Staatssammlung, Munich	Germany
19	Missouri Botanical Garden, Missouri	United States
20	Ludwig-Maximilians-Universität, Munich	Germany
21	United States National Arboretum, Washington, DC.	United States
22	Arnold Arboretum, New York Botanical Garden, Bronx	United States
23	Botanical Museum of Oslo	Norway
24	Muséum National d'Histoire Naturelle de Paris, Paris	France
25	Forest Research Institute, Pakistan Agricultural Research Council, Islamabad	Pakistan
26	Research Institute of Forests and Rangelands, Tehran	Iran
27	Naturhistorisches Museum Wien	Austria
28	N.I. Vavilov Institute of Plant Industry, Saint-Petersburg	Russian Federation
29	Eberhard-Karls-Universität, Tübingen	Germany

1.3 Status of the area of study and research goal

1.3.1 Kabul Province

Kabul is located between latitude 34.00º North and longitude 69.00º East at an altitude of 1800 m above sea level, situated between high mountains that are covered with snow until spring. The climate is arid with hot summers and cold winters. Winter can get very cold, particularly in the mountainous northwestern regions. The majority of annual precipitation falls in winter and spring. The highest annual rainfall reported in Kabul is approximately 400 mm. Practically no rain falls between June and October. Winter temperature ranges between -15°C and -20°C, while summer can range from 15°C to 39°C. In winter, sunshine ranges are around six to seven hours per day, and more than twelve to thirteen hours in summer (Committee Norwegian Afghanistan, 2019; Mehrad, 2020). Kabul is the capital of Afghanistan and is bordered by the provinces of Parwan in the northwest; Kapisa in the northeast; Laghman in the east; Nangarhar in the southeast; Logar in the south; and Wardak in the southwest (Figure 12).

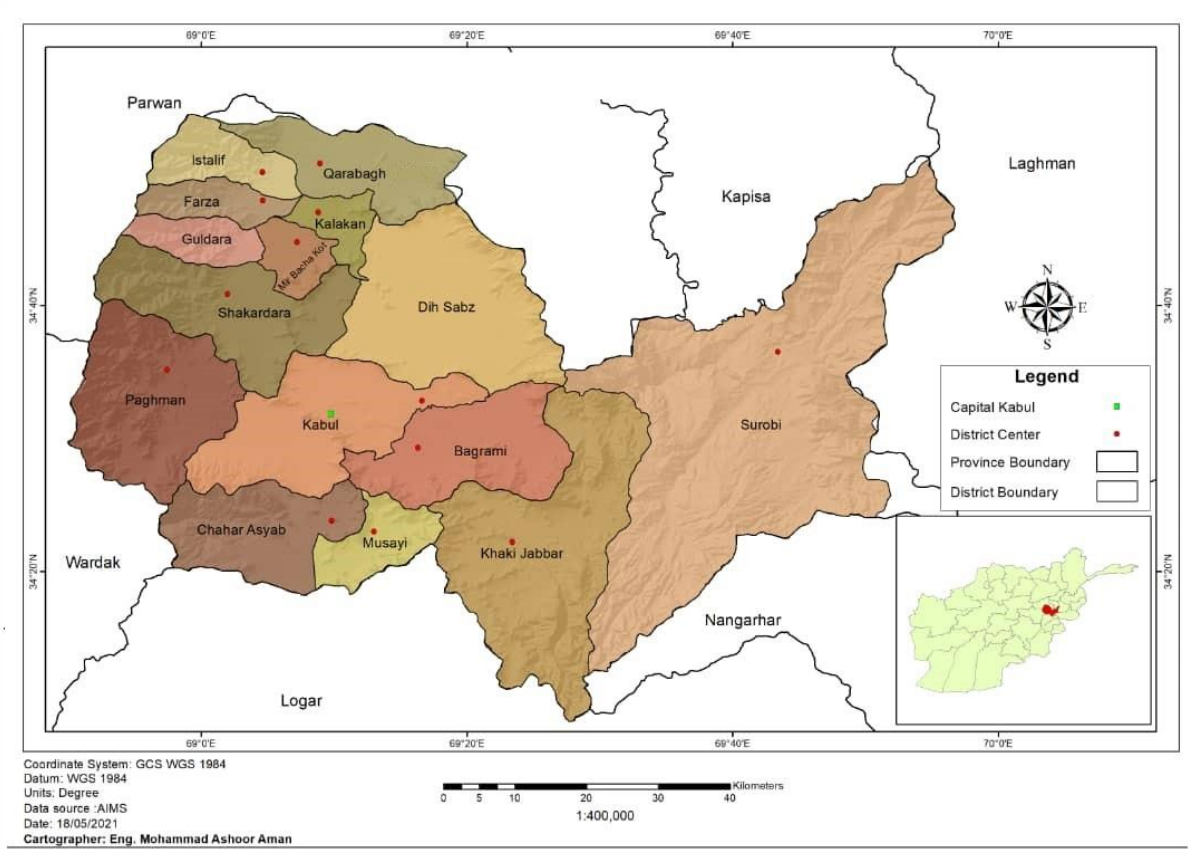


Figure 12 *Administrative map of Kabul province.*

It covers a land area of about 4,524 square kilometers. More than half (56%) of the territory of Kabul is made up of mountains and rough terrain, while 38% is flat (Mehrad, 2020). The

province administratively is divided into 15 districts namely Paghman (Figure 13), Chahar Asyab, Musavi, Khaki Jabbar, Bagrami, Surobi, Dih Sabz, Shakardara, Guldara, Farza, Istalif, Mir Bacha Kot, Kalakan, and Qarabagh. The last-mentioned seven districts are located in the north. They are called Kohdaman and have relatively fertile soil and water springs that are filled with water from the Hindu Kush Mountains. The most common trees growing in this area include various types of grape, peach, cherry, walnut, almond, mulberry, willow, ash, and many others. However, during the Taliban regimen, many of these fruit gardens have been destroyed. Fortunately, after the fall of the Taliban in 2001, people returned to their villages and reconstructed their destroyed fields and houses. But the springs, which were flowing in underground tunnels, remained unreconstructed, and people are suffering from a shortage of irrigation water. Now people mostly use power generators to pump water from deep wells they have excavated.

Figure 13 *A view of Paghman, Kabul province (photo by M. Keusgen, 2015).*

1.3.2 Parwan Province

The Parwan province is located between latitude 34.96º North and longitude 68.81º East at an altitude of 1900 m above sea level. It covers a land area of about 5,974 Km^2 and the estimated population of the province is 751,040 (NSIA, 2021-22). The province is multi-ethnic with mostly rural settlement. Climate is characterized by a semiarid with overall annual precipitation

of 300-400 mm, in Salang highlands, the annual precipitation is reported from 800-1000 mm. The average temperature is 25-30 ºC in summer and -5 to -10 ºC, in Salang even -25 °C, in winter (Rasouli, 2021). It is bordered by Baghlan in the north, west by Bamyan, south by Wardak, Kabul, and Kapisa and Panjsheer in the east (Figure 14). The province has been divided into ten administrative units; namely, Charikar which is the center of Parwan province and one of the most populated cities in Afghanistan. Charikar city is located about 64 Km north of Kabul and west of the junction of the Ghorband and Panjshir rivers. The main road from Kabul to Baghlan and the north of Afghanistan passes through Charikar.

The population of the city was estimated at 29,400 people in 1988, and today it is 53,676. The area between Kabul and Charikar is the densest in Afghanistan in terms of population. The industry of linen fabric and making knives and metal tools is famous in Charikar and its surroundings in Afghanistan. Pottery, ice cream (Sheer yakh), and grapes of this city are also famous. In the 1960s, Afghanistan's largest textile factory was built in Golbahar near Charikar which caused the population of Charikar to grow here after. Golgandi hill is one of the famous points of the city attracting thousands of tourists every year. Golghandi hill excursion, which is one of Afghanistan's spring tourist attractions, was founded in 1945 AD during the time of Mir Alam Khan, the mayor of Charikar (Ahmadi, 2007). Most of the people of this city are Tajiks. In legends, the foundation of Charikar city is attributed to King Jamshid. Its historical foundation is also considered by King Kanishka of the Kushan dynasty. Among its famous villages are Bayan Alia, Deh Melayusov, Wazir Khan Castle, Badal Castle, Tilanchi, Tughbirdi, Tutomdara, Hofian, and Khajah Siah Ran. ii) Sayd Khel district is located six kilometers to the north of Chahrikar. Its residents are engaged in the agriculture of wheat and grain production. iii) Bagram District is located eight kilometers to the east of Chahrikar. The people of the locality are associated mainly with grape orchards. iv) Kohi Safi District is located 15 kilometers to the east of the capital, and most inhabitants of this district are farmers. v) Jabalussaraj district is located 10 kilometers to the north of the capital. Its inhabitants are farmers. vi) Salang District is located 15 kilometers to the north of the province's capital. Here the main profession is agriculture and livestock breeding. vii) Shinwari district is located 30 kilometers to the west of the capital at the onset of Ghorband valley. Most of its residents are farmers and are associated with the agriculture of apricot, cashew, grapes, pears, and other fruits. viii) Ghorband District is located 20 kilometers to the southwest of Chahrikar, and the main occupation of its inhabitants is agriculture, livestock breeding, and orcharding. ix) Surkhi Parsa District is a part of Ghorband valley and is located at a distance of 40 kilometers from

the capital of the province. Its inhabitants are mainly associated with the orchard business. x) Shekh Ali District is located 40 kilometers to the Northwest of the capital at the end of Ghorband valley, its population's main profession is orcharding. The agricultural land of Parwan province is irrigated mainly by the three main rivers namely Ghorband, Salang, and Panjshir. The most important agricultural products are grapes, apricots, apples, almonds, mulberries, cherries, and walnuts.

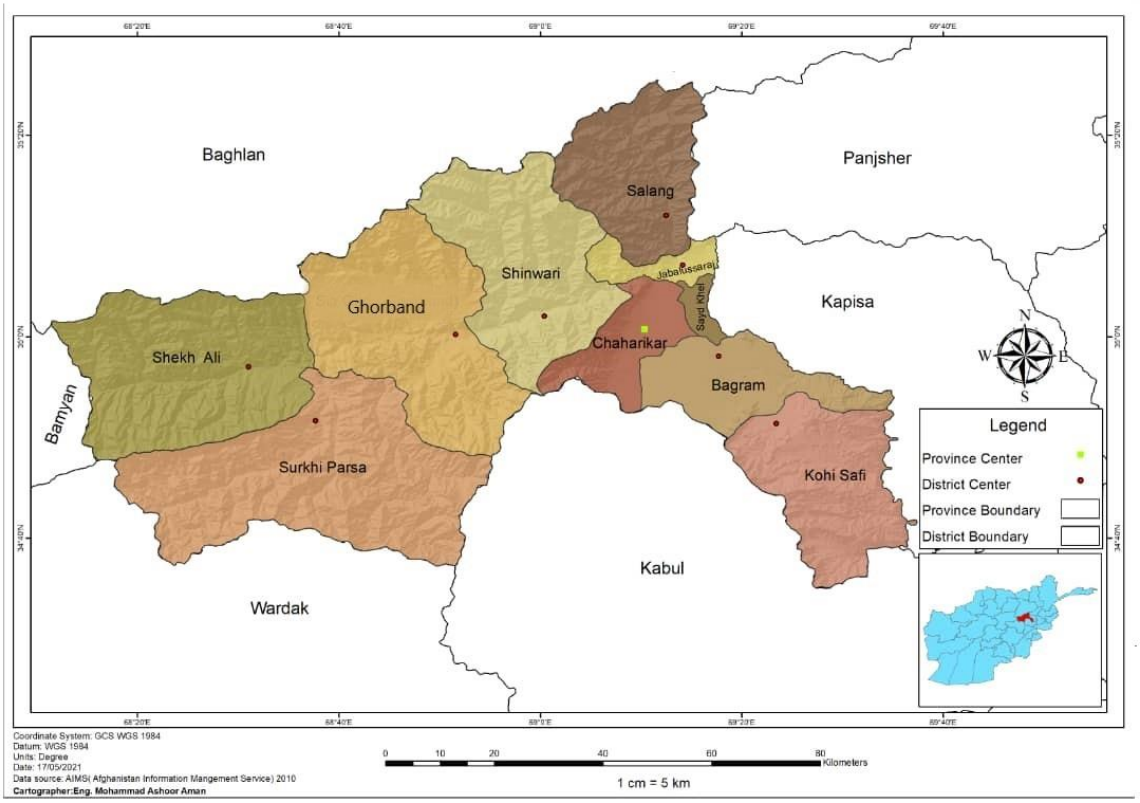


Figure 14 *Administrative map of Parwan province.*

Ghorband valley situated in the Central Western Hindu Kush and approximately making two third of the province in terms of land coverage is blessed with a high abundance of water from the surrounding glaciated higher regions. Thus, along the rivers based on irrigation fertile cultural landscapes (Lolinj, Frinjal (Figure 15), Chardeh, Qemchaq, Siahgerd, Darazgerd, etc.) have developed, where cereals and an enormous variety of fruits such as almonds, apples, plums, apricots, cherries, walnuts, grapes, peaches, pears, and mulberries are grown. *Populus nigra* var. *italica* is widely cultivated under irrigation for timber and construction material. Also, *Nicotiana rustica* L. (Figure 16) is cultivated mostly in Turkman valley, Surkhi Parsa district, for commercial purposes.

Figure 15 *A view of Frinjal village (photo by O. Rahimi)*

The valley is divided into four districts, namely Shinwari, Ghorband, Surkhi Parsa, and Shikh Ali, which have been discussed in previous paragraphs. The Ghorband River rises from Shibar pass and flows east; the springs and especially melting snow of the Hindu Kush high mountains feed it. This river is the main source of irrigation water in the province and, in addition to the Ghorband areas, it irrigates most of Charikar, Saydkhel, and Bagram. The valley has significant ore reserves of talk, lead, iron, zinc, sulfur, antimony, and coal. Unfortunately, the vegetation of Ghorband valley, as well as Salang valley, has been destroyed by the extensive collection of firewood and grazing of animals by inhabitants as well as nomads of Pashtun ethnos, that during spring, move from the eastern provinces to the north and stay there until fall. They used wild trees and shrubs as firewood and their animals eat herbs, small shoots, and shrubs and, thus, prevent vegetation from reviving itself. Therefore, a large part of the land is subject to soil destruction, and pastures and grazing lands are destroyed.

Figure 16 *Nicotina rustica plantation in Turkman valley, Parwan (photo by Karimi).*

1.3.3 Aims and objectives

Ethnomedicinal research and investigations are very important for the innovation of new pharmaceuticals from indigenous reported medicinal plants. The current study aimed to document the indigenous medicinal knowledge of plants used as a remedy for curing various diseases in the Kabul and Parwan provinces. Therefore, the study focuses on the following objectives:

- To identify the medicinal plants traditionally used by people in Kabul and Parwan provinces,
- to document the traditional knowledge about the use of these medicinal species from the local population of the areas,
- to compare the traditional uses of these medicinal plants with scientific reports,
- To provide a scientific rationale for the validation of the claimed therapeutic properties of these medicinal plants.

1.3.4 Research questions

The structured questionnaire contained the following questions:

- What is the diversity of medicinal plant resources in the Kabul and Parwan provinces?
- How do people use medicinal plants and what are the most important parts of these plant species to cure diseases?
- What is the level of traditional knowledge about medicinal plants among the population of the studied region?
- What is the consistency between the traditional use and rational use of medicinal plants in the regions?

2 MATERIAL AND METHODS

2.1 Formulating questionnaires

The structured questionnaire was prepared in English and Farsi/Dari language and contained the following items (27 questions, partially with sub-questions): ordering No. of the questionnaire, date of interview, place of interview, interviewer, interviewed person, name, and surname of the interviewed person (alternatively: description of a meeting of people with the number of people, age distribution, sex, etc.), age and sex of the participant, address of the participant, duration of residence of the participant, educational level of the participant, occupation (profession) of the participant; plant details as what is the local name of the plant used, which parts of the plant do you use? (roots, flower, leaves, whole plant, etc.), for the treatment of which diseases do you use the plant (alternatively: for which food/dish/drink or further purpose do you use the plant), the plant is useful as food, medicinal plant, cosmetics, religious purposes, ornamental, provided to other people, others; application of plant parts, how and when is the plant used, how to prepare the plant for usage (fresh, dried, boiled, as tea, tincture, others), an approximate dose of the plant; has the traditional use changed during last decades or the last generation, do you know an interesting story about this (e.g., the now collected plant is a replacement for another one, which has been over-harvested two decades ago); further aspects: is the described medication used in combination with other herbs or foods or drinks or something else, is the given information coming from your own experience or did someone introduce the use of this plant to you (e.g., information obtained from mother grandmother, local healer, etc. If details were given, please describe), do you need a prescription from a healer or a physician for the described plant, do you use the described medication personally and/or for your family and relatives, do you collect the described plant for personal usage or do you sell or give it to further persons? Do you trade with medicinal plants, when do you collect the plant (the month in the year), and how long can you store the collected plant material or prepare medicine out of it; further remarks. Personal data are kept confidential and are only used for specific requests and not for publication.

2.2 Ethnobotanical data collection

Ethnomedicinal data has been collected through participatory assessment, which was based on an interview with indigenous people and observation in the field. The interviews were conducted using the above-mentioned semi-structured questionnaires with local people who were engaged in the use of medicinal plants and were mainly referred by villagers. The

questionnaires consisted of two parts, the first part was for demographic information of participants, and the second part was assigned for plant information. The demographic characteristics of the respondents were determined and recorded through face-to-face interviews. Participants included a diverse range of community members including farmers, traditional healers, housewives, teachers, merchants, public workers, artisans, laborers, students as well as health workers who are reputed among people as traditional and experienced practitioners with sound knowledge regarding medicinal plants. The interviews were conducted in the local language of the participants since most of them were not educated. All interviews were conducted after obtaining verbal consent from participants informed beforehand. Interviews took place in participants' homes and fields, along roadsides, as well as in the markets in Kabul and Charikar cities. Information on the uses of plants to treat different illnesses of human beings, parts used, technics of preparations, and administration of medicine have been recorded.

Turkman valley, 2016 Chakari, 2017

Figure 17 *Interview with informants in Chakari (Kabul) and Turkman valley (Parwan).*

2.3 Collection of the plants from the field

During several short field visits between 2015 and 2019 around Kabul and Parwan provinces, all the plant specimens were collected except very commonly cultivated plants. The primary identification of plants was made by the author. Plants unfamiliar to the author were identified with the assistance of informants and local inhabitants; then, voucher specimens were collected. Specimens were immediately placed in a herbarium press and carried to the University of Kabul. After drying specimens inside the press, they were mounted on herbarium sheets and labeled using botanical standard methods and deposited for future reference at the Herbarium of the Faculty of Pharmacy, Kabul University, Afghanistan.

Figure 18 *Short field trips to the mountainous areas of Parwan province.*

2.4 Identification of plant specimens

Most of the medicinal plants were primarily identified by the author. Plants unfamiliar to the author were identified with the help of informants and local people and then the identified species were validated and confirmed using the literature on these plants and the vegetation of Afghanistan and the neighboring country Pakistan, namely Field Guide Afghanistan (Breckle & Rafiqpoor, 2010), Vascular Plants of Afghanistan (Breckle, et al., 2013), Medicinal Plants of Afghanistan (Keusgen, et al., 2020), Trees and Shrubs of Afghanistan (Alam, 2011), Younos, et al., (1987), and Ethnobotany of the Genus *Artemisia* L. (Asteraceae) in Pakistan (Hayat, et al., 2009). Then specimens were matched and compared with authentic virtual specimens in Kabul University, Faculty of Sciences (KUFS) Herbarium, the virtual herbarium of Royal Botanical Garden (Kew, n.d.), and a jointly administered herbarium management system and specimen database (JACQ, n.d.). While the suspicious and dubitable specimens were confirmed by Prof. S. W. Breckle, University Bielefeld, Germany, and Dr. R. M. Fritsch,

IPK Gatersleben, Germany, using live specimens and photographs (Figure 19). All scientific names of the plants were confirmed using the International Plant Names Index (IPNI) online database.

Figure 19 *S. -W. Breckle & R.M. Fritsch discussing the identification of plant specimens (Marburg, Germany).*

2.5 Data analysis

The collected information from the interviews, which were recorded as field notes in the local language was prepared in Microsoft Excel for visualization and cross-tabulation and then the data was transferred to IBM SPSS Statistics (version 26) for statistical analysis. Descriptive analyses were performed to interpret the data.

All recorded medicinal plants were grouped into 8 categories, based on the main uses reported (number of uses in a disease category $\geq 20\%$ of the total number of uses reported for a particular species) by our informants which include nervous system ailments, cardiovascular diseases, respiratory illness, gastrointestinal disorders, urinary tract and gynecological disorders, dermal and muscle-skeletal disorders, infectious and heat-related disorders and diabetes. To confirm

the uses reported by our informants and carry out a pharmacological validation in reported plants, we used Physician's Desk Reference (PDR) for Herbal Medicine, which is a comprehensive guide to medicinal plant sources that includes more than 700 plant monographs with information on safety and efficacy. The information provided is mainly based on the German Federal Health Authority's Commission E. A literature review was carried out for the plants that were reported to be in widespread use, for which no monograph exists in the PDR.

2.6 Establishment of an herbarium in the Faculty of Pharmacy

A herbarium is a collection of dried plant specimens, kept as the reference standard for future scientific studies. It assists the basic need of identification for elementary and applied research in botany, pharmacognosy, agriculture, biology, biotechnology, and genetics (Hedberg, 1993). In the herbarium, voucher specimens of dried and pressed plants are housed in the form of sheets to compare unknown newly collected plants with them. A herbarium specimen offers a persistence record for a species growing at a specific time and place, forms the basis of trustworthy distribution, habit, and territory information acts as the reference point for the application of the scientific names, is offering the basic biological material for researchers, and serves as vouchers, for toxicological cases, chemical studies and bio finding (Ahmed & Hasan, 2016).

The plant collection at the Pharmacy Faculty of Kabul University probably traces back to 1964. The collection has been established primarily for the student’s practical teaching and research purposes. However, due to the absence of a botanical storeroom in the faculty, the plant samples which were collected during those years were kept on an open shelf and have not been further documented. This small collection was the core of the primary herbarium in the Faculty of Pharmacy which was mainly collected by professor Dr. Mohammad Shafiq Younos and other professors at that time. Anyway, the old herbarium sheets in our herbarium show that plant-collecting activity continued till 1978. However, in subsequent years, due to the Russian invasion of Afghanistan, botanical research decreased and was even abandoned for some periods.

During the years 1964–1978, the country was stable and researchers carried out their fieldwork. But unfortunately, after the Russian invasion in 1979, the Afghan-Soviet war started and everything changed. The opportunity for researchers to travel the country and do fieldwork diminished. Even this activity was abandoned during 1986 – 2002.

During the civil war, from 1992-1994, the upper floor of the Faculty of Pharmacy burned, and the plant collection which was located on the second floor was damaged and remained under the soil and dust for years waiting to be restored. Eventually, at the end of 2003, it was decided to restore the collection. The restoration of the collection started in December 2003. The collection, which was under the rubble, clouds of dust, and soil, were infected by molds and fungi and most herbarium sheets got black. There was no record available about the number of herbarium specimens; however, 1,500 herbarium sheets were withdrawn by the author and rescued from the rubble. About 700 of the above-mentioned specimens were in relatively good condition, were cleaned, and housed in a wooden box. This old collection remained in the wooden box in a dusty storeroom, waiting to be restored.

From 2005 to 2006, a multi-stakeholder project managed by the International Center for Agricultural Research in the Dry Areas (ICARDA), collected many specimens of 6 medicinal and aromatic plant species of Afghanistan, namely *Glycyrrhiza* spp., *Artemisia* spp., *Carum carvi* L., *Cuminum cyminum* L., *Ferula assa-foetida* L., and *Ziziphus jujuba* Mill., from nine provinces of Afghanistan and were housed at the Faculty of Pharmacy. However, due to insufficient staff and a lack of interest in this field during that period, plant-collecting activity stopped during 2007-2010.

In 2011, ethnobotanical activities were initiated by the author intending to identify medicinal plants and to document indigenous knowledge about medicinal plants used in Afghanistan. In this nonfinancial project, mainly students were integrated and given assignments to collect data regarding the use of medicinal plants from their villages as well as to collect medicinal plant specimens during their vacations and weekends. The results of these activities were drafted in 55 Pharm. D. theses in the Faculty of Pharmacy, Kabul University which is mainly directed by the author.

At the beginning of 2015, the above-mentioned activity was accelerated by the start of the Joint Afghan-German project. Thus, due to the aim of this project and the development of the current specialized Ph.D. project and the approach of the phyto-pharmacological studies arose an urgent need for a well-equipped scientific herbarium capable of identifying and recording collected plant specimens. Therefore, the idea of establishing an independent medicinal herbarium was raised. It started its activities in 2015 in a small room based on scientific principles. Already in the initial stage, it was possible to make a very valuable collection from different regions of the country in a short opportunity and to present it to researchers and those

interested in the botanical investigation. The herbarium was established with the partial financial support of this project and was equipped with special botanical cabinets (Figure 20). The restoration of the old collection started, and herbarium sheets were cleaned, relabeled, and all registered. However, due to the inattention of one of our staff who was responsible for the registration and relabeling of the old collection, approximately half of the old plant specimens which were fine and brittle have lost their feature and were therefore rejected and excluded from the collection and only 343 out of 700 specimens were included to the herbarium. All old and recently collected specimens were transferred to the new cabinets and were ordered according to plant families and genera.

Status of the collection before 2015 Status of the collection in 2015

Figure 20 *A view of the herbarium of the Faculty of Pharmacy.*

In 2016, following the physical development of Faculty space and the establishment of the Pharmacy Faculty extension, a room was dedicated to the herbarium, and now the herbarium has a collection of over 2,300 specimens, representing about 67% of the medicinal plants of Afghanistan. The collection now acts as a reference herbarium for both scientists and students alike. Now it initiates the center for information and research on Afghanistan's medicinal plants. It helps the scientific community to engage in discovering, describing, monitoring, surveying, naming, and classifying Afghanistan medicinal plants. Now the herbarium has a significant number of medicinal plant specimens from different parts of the country, making it one of the unique collections of medicinal plants in the country.

The collection includes specimens from the 22 provinces, which are mainly represented by specimens from Parwan, Kabul, Bamyan, Wardak, Farah, Herat, and Faryab provinces (Figure 21).

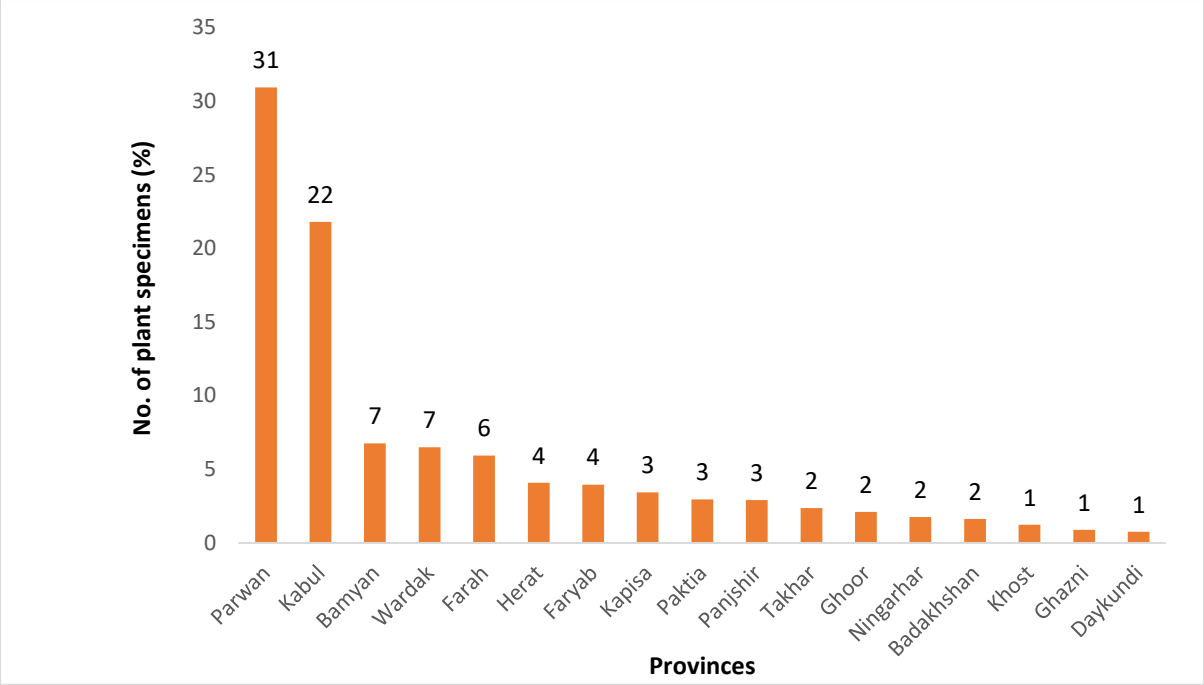


Figure 21 *Statistics of plant specimens in the Herbarium according to their localities.*

The majority of plant specimens in the herbaria were collected by the author and collectors who worked under his supervision, and the most often represented specimens are related to the current research area. Some of the specimens brought in by students for identification have also been added. Apart from routine identifications in the herbarium, over 500 fresh and old plant specimens have been identified in recent years. Furthermore, we collected and stored many crude materials of medicinal plants in this herbarium, too. Also, a small collection used for the teaching of botany (morphological reference herbarium and laboratory crude drugs) is regarded as a short-term collection and thus not considered part of the Faculty of Pharmacy Herbarium.

The data about the new collections, such as scientific names, vernacular names, locality from where the specimen was collected, date of collection and collector's name, and so on have been recorded both in hard and soft files. A new program has been initiated in 2017 for creating a virtual database for the herbarium.

Now the database is ready for data entry and information about some collections is already available on the internet (htpp://herbarium.ku.edu.af). It is expected that the database will reflect the information on all available medicinal plants in the herbarium of the Faculty of Pharmacy. Since more cabinets were needed for the classification and division of voucher specimens in the herbarium, the author requested support from the project coordinator in the middle of 2021 to equip this herbarium as much as possible. As a result of the generous contributions of the aforementioned institution, 8 more special botanical cabinets were added

to this herbarium. In this way, cabinets and shelves were favorable for the classification of the specimens in the herbarium, which had not been done properly before due to the lack of botanical shelves (Figure 22).

The main purpose of the establishment of this herbarium is to collect, identify and evaluate medicinal plant species of different regions of the country in line with ethnobotanical studies for documentation of traditional knowledge for both future generations and other communities as well as for conservation and resource management.

Collecting, identifying, and comparing plant specimens using available sources, carrying out plans to collect the flora of different regions, and ethnobotanical surveys of rural and native populations in order to obtain and document traditional knowledge of medicinal plants used in the traditional and folkloric medicine of different parts of the country, the keeping and maintenance of documented specimens for different research projects (pharmaceutical and various botanical research such as molecular and systematic plant studies, plant sociology, ethnobotany, etc.) will be important activities of this herbarium in the future.

Figure 22 *Current view of the herbarium*

3 RESULTS

3.1 Demographic information

In this study, a total of 1248 people, consisting of 986 males and 262 females, were interviewed. Because of the highly conservative social structure, access to females in terms of interviews is restricted. Participants represent a diverse range of community members such as farmers, traditional healers, housewives, traders, teachers, public workers, craftsmen, laborers, students, health workers, and so on. Participants ranged from 18 to 90 years old; 0.7% of participants were under 20 years, 8.8% were aged 21-30, 14.4% were 31-40, 26.7% were 41 to 50, 24.5% were 51-60, 14.9% were 61-70, and approximately 9% were older than 70. The number of species reported by young informants is lower compared to elder informants; in detail, participants under 40 years of age in the study area were found to be less knowledgeable than those over 40 ones. Participants consisted of literate and illiterate people. Literate informants were at different levels of education (Table 2).

Table 2 *Demographic information of the participants*

VR	Category	FQ	%	VR	Category	FQ	%
Sex	Male	2958	79	Occupation	Farmer	916	24.4
	Female	802	21		Traditional healer	573	15.2
Age	<30	358	9.5		Housewife	463	12.3
	31-40	541	14.4		Teacher	427	11.4
	41-50	1003	26.7		Salesman	290	7.7
	51 -60	923	24.5		Public worker	262	7.0
	61-70	560	14.9		Jobless	222	5.9
	>70	334	8.9		Craftsman	146	3.9
Education level	Uneducated	1583	42.1		Labor	74	2.0
	Secondary education	648	17.2		Student	67	1.8
	Higher education	528	14.0		Other activities	320	8.5
	Primary education	504	13.4	Abbreviations: VR= Variables, FQ = Frequency			
	Middle education	315	8.4				
	Vocational (14 grade)	132	3.5				
	Religious education	28	0.7				
	University student	22	0.6				

3.2 Medicinal plants and associated indigenous knowledge

In this study, a total of 270 medicinal plant species were recorded to be used among the people for the management of various diseases in the study area. We found that of the 270 medicinal plant species 145 (54%), have monographs in the PDR and have already been

pharmacologically validated at least for one of the claimed medicinal uses reported by our informants. Also, we found that 82 out of 270 identified recorded plant species in our study area were previously reported by Volk (1955a) (Ref. 1) in Afghanistan, 126 out of 270 were reported by Younos et al. (1987) (Ref. 2), and 164 out of 270 were reported in the recently published handbook Medicinal Plants of Afghanistan (2020) (Ref. 3) which are showed in the (Figure 23). It is important to highlight that 90 species have not been reported in the three references that were taken into consideration and here are reported for the first time from Afghanistan.

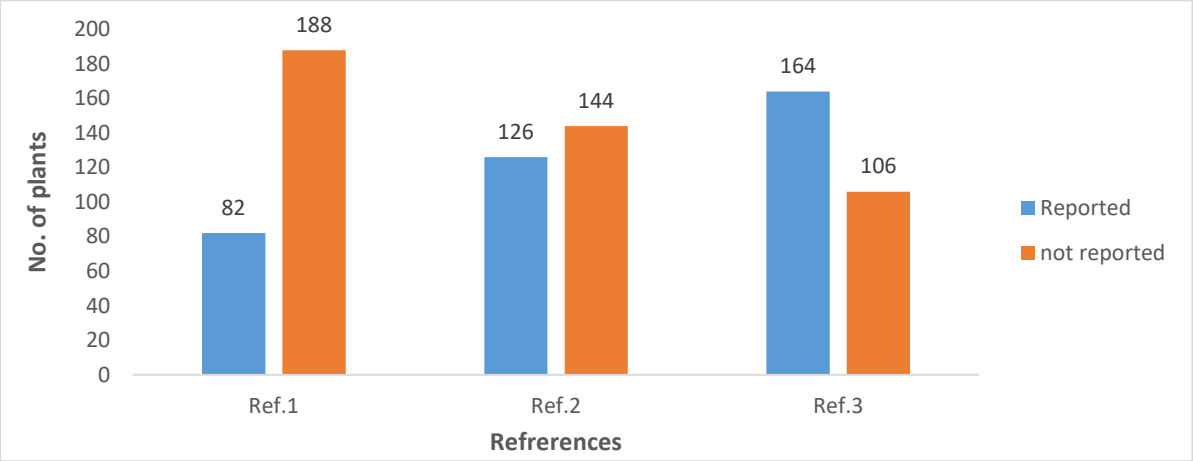


Figure 23 *Review of medicinal plants in the three references of Afghanistan.*

We found elderly people in the Kabul and Parwan region, particularly in the suburb area, have a good knowledge regarding the traditional use of plants for their different basic requirements such as medicine for curing diseases, food for humans as well as for livestock, and firewood for heating and cooking and for making agricultural apparatuses and so on. Local inhabitants collect plants from their vicinity and agricultural fields. They gained plant knowledge from their ancestors and carried it from generation to generation but it seems that the young generation has lost such knowledge and is less familiar compared to the elder generation, which has to be considered because the traditional knowledge is not documented in Afghanistan and the traditional healer and elder generation, which are rather familiar with the traditional use of medicinal plants, pass away without handing over their knowledge. According to the reports of old people, many plants are in danger of being lost in the region, due to overharvesting for fuel, fodder, and land usage as a result of the increasing population.

Medicinal plants reported by our informants in the study area are presented in Table 3, where species are listed alphabetically by family accompanied by their scientific name, local name, part used, preparation, uses, and their frequency of report by informants.

Table 3 *Medicinal plants used in the traditional medicine of Kabul-Parwan provinces*

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
1	**Pteridaceae***:* *Adiantum capillus-veneris* L.	Pari Syawashan	N	H	In	Antitussive (1), expectorant (2), and anthelmintic (1).	2
2	**Adoxaceae***:* *Sambucus racemosa* L.	Aqtisurkh	N	FU	De	Diaphoretic (1), antipyretic (1), antiseptic (1), and against stomach microorganisms (1).	1
3	**Amaranthaceae***:* *Amaranthus retroflexus* L.	Tajikhroos	N	IF	Ju	Antitussive (1), sore throat (2), gonorrhea (2), hemorrhoids (1), and menstrual bleeding (1).	5
4	*Spinacia oleracea* L.	Palak	N	LE	Co, Ju	Against gonorrhea (1), anti-icteric (1), joint pain (1), and anemia (1).	3
5	**Amaryllidaceae***:* *Allium cepa* L.	Piyaz	N	BU	Fr	Antihypertensive (1), blood purifier (1), hypolipidemic (2), intestinal disorders (1), appetizer (1), intoxication (1), antidysenteric (1), abscess (1), antimicrobial (3), pneumonia (1), otitis (3), antiseptic (1), sexual problems (1), dysuria (2), anti-inflammatory (1), bladder problems (1), kidney problems (1), and toothache (1).	17
6	*Allium circumflexum* Wendelbo	Bolan	N	LE	Co	Against constipation (3), antihypertensive (1), and antipyretic (1).	5
7	*Allium mirum* Wendelbo	Gushi gurg	N	BU	Fr	Antihypertensive (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
8	*Allium sativum* L.	Sier	N	BU	Fr	Antihypertensive (23), hypolipidemic (4), antiatherosclerotic (2), heart problem (2), antiseptic (3), antibacterial (2), appetizer (3), against digestive disorders (2), flatulence (3), antidiarrhoeal (1), anti-inflammatory (1), common cold (1), hair tonic (3), respiratory disorders (4), and bedwetting of child (1).	35
9	*Allium schoenoprasum* L.	Gandaneh	N	LE	Co	For treatment of hemorrhoids (3) and antiemetics (1).	3
10	*Narcissus poeticus* L.	Gulinargis	N	BU	Ms	For the freshness of the face (1).	1
11	**Anacardiaceae***:* *Mangifera indica* L.	Umm	I	SE	Pw	Antidiarrhoeal (9), antidysenteric (2), and male sexual desire enhancement (1).	13
12	*Pistacia atlantica* Desf.	Khinjak	N	RE, LE	De, Pw	For amenorrhea (1) and antidiarrhoeal (1).	1
13	*Pistacia vera* L.	Pisteh	N	FU	Dy	Anemia (1), bone calamia (1), and eye problems (1).	1
14	**Apiaceae**: *Anethum graveolens* L.	Shebiet	N	HE, SE	In, Pw	Antihypertensive (34), antidiabetic (2), flatulence (6), stomachache (5), digestive (2), spice (2), and lactogenic (3).	63
15	*Apium graveolens* L.	Margizanan	N	HE, SE	In, Pw	Antihypertensive (4), flatulence (1), constipation (1), and dermal itching (1).	6

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
16	*Carum carvi* L.	Zirehi syah	N	SE	De, Pw	Flatulence (2), antidiarrhoeal (1), digestive (2), appetizer (2), constipation (1), gastric ulcer (1), antiemetic (1), common cold (1), and anti-microbial (1).	20
17	*Conium maculatum* L.	Shukran	N	SE	Pw	Analgesic (2).	2
18	*Coriandrum sativum* L.	Gashniz	N	HE, SE	Fr, In Pw	Stomachache (5), digestive, (9), flatulence (4), appetizer (3), antispasmodic (3), constipation (1), stomachic (1), sexual impotence (3), otitis (1), eye pain (2), headache (1), common cold (1), antihaemorrhagic (1), migraine (1), hypolipidemic (1), and pneumonia (1).	26
19	*Cuminum cyminum* L.	Zerah	N	SE	In, Pw	Flatulence (15), antidyspeptic (2), digestive diseases (7), constipation (5), stomachache (6), antimicrobial (6), common cold (1), pneumonia (2), hypolipidemic (2), and lactogenic (3).	26
20	*Daucus carota* L.	Zardak	N	RO, SE	De, Fr, Co	Eye tonic (9), nyctalopia (7), rejuvenation of skin (4), aphrodisiac (3), infertility (1), antiemetic (1), antidiarrhoeal (2), intestinal pain (1), flatulence (2), stomachic (1), hemorrhoid (1), hyperacidity	30

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						(1), colon cancer (1), bone fractures (4), anti-icteric (1), tonic (1), and anti-obesity (1).	
21	*Ferula downieorum* Spalik, M.Panahi, Piwczynski & Puchalka (*Dorema aureum* Stocks)	Chaheer	N	RE	Pi	Hemorrhoid (1).	1
22	*Ferula assa-foetida* L.	Hing	N	RE	Pi	Anthelmintic (4), stomachache (2), antispasmodic (1), hemorrhoid (1), infertility (1), toothache (1), measles (1), and sore throat (1).	7
23	*Ferula diversivittata* Regel & Schmalh.	Badbui	N	RE	Pi	Stomachache (2), anthelmintic (1), antitumor (1), foot cracking (1), anti-arthritic (1), backache (1), and antihypertensive (1).	5
24	*Ferula narthex* Boiss.	Ushai	N	RO	Mc	Appetizer for livestock (3).	3
25	*Ferula ovina* Boiss.	Kamai	N	RO	Mc	Toothache (2), hemorrhoid (1), infertility (1), and antihypertensive (1).	5
26	*Ferula* sp. (not further specified)	Borbu	N	RO	Pw, Sm	Stomachache (10), flatulence (7), antidiarrhoeal (1), antispasmodic (1), get rid of “Jinn” (1), the evil eye (2), antihypertensive (1), kidney problems (2), antidiabetic (3), menstrual pains (1), and infertility (1).	27

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
27	*Foeniculum vulgare* Mill.	Badian	N	HE, RO, SE	In, Pw	Antispasmodic (3), stomachache (43), flatulence (32), antidiarrhoeal (3), constipation (7), digestive disorders (7), appetizer (2), respiratory disorders (2), expectorant (1), antipyretic (1), antitussive (4), bronchitis (2), pneumonia (2), lactogenic (4), common cold (3), diuretic (4), amenorrhea (3), anti-obesity (2), anemia (3), eye disorders (3), and general tonic (1).	99
28	*Heracleum lehmannianum* Bunge (*H. afghanicum* Kitam.)	Baldarghan	N	LE, FL, RO	De, In, Fr	Antihypertensive (4), Antiemetic (2), antiemetic (2), flatulence (1), antidiarrhoeal (1), stomachache (1), sore throat (2), against typhoid (2), hepatitis (1), anti-icteric (1), heatstroke (1), analgesic (1), fever (1), muscle spasm (1), and asthma (1).	19
29	*Levisticum officinale* W.D.J. Koch.	Karafs	N	HE, RO	Pw, De	Antihypertensive (25), hypolipidemic (5), antidiabetic (2), digestive disorders (10), antispasmodic (1), stomachache (7), hemorrhoid (2), dyspnea (1), heatstroke (2), antipyretic (1), anticatarrhal (1), and nervous diseases (1).	42
30	*Pastinaca sativa* L.	Shaqaqul	N	HE	De	Backache (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
31	*Pimpinella* sp. (not further identified)	Badkeh	N	HE	In, Pw	Common cold (5) and heatstroke (2).	7
32	*Petroselinum crispum* (Mill.) Fuss	Jafri	N	LE, FU	Po	Hemorrhoid (1).	1
33	*Prangos pabularia* Lindl.	Ghighu	N	RO, SE	De	Flatulence (2), stomachache (1), toothache (3), antihypertensive (1), bruises (1), wound healing (1), and anti-cancer (1).	7
34	*Trachyspermum ammi* (L.) *Sprague* (*T. copticum* (L.) Link)	Javani	N	SE	De, In, Pw, Sm	Stomachache (20), flatulence (20), constipation (3), digestive (2), gastritis (3), hyperacidity (1), peptic ulcer (2), pneumonia (5), anthelmintic (2), backache (2), infertility (1), and spice (1).	58
35	**Apocynaceae**: *Nerium oleander* L.	Gandireh	N	LE	De, Pw	Heart disorders (1), cardiotonic (1), and diuretic (1).	1
36	**Araceae**: *Acorus calamus* L.	Egger	N	RO	In, De, Pw	Flatulence (4), stomachache (2), dermal wounds (1), constipation (1), peptic and duodenum ulcer (1), stomach disorders (1), anti-inflammatory (1), hypolipidemic (1), and common cold (1).	7
37	**Arecaceae**: *Areca catechu* L.	Supari	I	SE	Pw	Blood purifier (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
38	*Cocos nucifera* L.	Narial	I	FU	Fr, Ju	Infertility (1), amenorrhea (1), and antituberculotic (1).	2
39	*Phoenix dactylifera* L.	Khurma	I	FU	Fr, Dy	Against osteoporosis (1), anticatarrhal (1), sore throat (1), bronchitis (1), bone fracture (1), facial vivacity (1), hair growth (1), general tonic (1), digestive (1), kidney disorders (4), backache (1), amenorrhea (1), anti-arthritic (1), anticancer (1), premature birth (1), childbirth pain (1), and sedative (1).	7
40	**Asparagaceae**: *Asparagus officinalis* L.	Marchobeh	N	RO	De, Pw	Constipation (1), stomachic (1), epilepsy (1), diuretic (1), heart pain (1), liver disorders (1), blood purifier (1), antirheumatic (1), antigout (1), kidney, and bladder stones (1).	3
41	**Asphodelaceae:** *Eremurus persicus* (Jaub. & Spach) Boiss.	Kharshirish	N	LE	In, Pa	Against foot pain (1) and stomatitis (1).	2
42	*E. stenophyllus* (Boiss. & Buhse) Baker	Sich, Shari	N	LE	Co	Against stomachache (3), flatulence (1), constipation (2), and anthelmintic (1).	6
43	**Asteraceae**: *Achillea millefolium* L.	Bui e madaran	N	FL, HE	In, Pw, Pa	Antidiarrhoeal (2), flatulence (1), antiemetic (1), abdominal pain (2), and antitussive (2).	3

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
44	*Achillea wilhelmsii* K. Koch	Zard Sarak	N	FL, HE	In, Pw, Pa	Stomachache (50), antidiarrhoeal (31), antidysenteric (4), anthelmintic (2), antiemetic (2) kidney problems (6), and menstrual pain (1).	112
45	*Arctium lappa* L.	Rishehibabadam	N	RO	De	Antirheumatic (1), emollient (1), antidyspeptic (1), acne (1), and skin dryness (1).	1
46	*Artemisia absinthium* L.	Mastaar	N	HE, FL	In, Pw	Antidiabetic (23), hypolipidemic (8), stomachache (9), flatulence (7), appetizer (2), anthelmintic (8), and analgesic (14).	70
47	*Artemisia alba* Turra (*A. camphorata* Vill.)	Kermak Boteh	N	HE, FL	In, Pw Co	Anthelmintic (14), stomachache (19), flatulence (8), antiemetic (2), and digestive (4).	63
48	*Artemisia dubia* Wall. ex DC.	Dommi-gosaleh	N	HE, FL	In, Pw	Gastroenteritis (1), stomachache (1), flatulence (2), antidiarrhoeal (1), digestive disorders (1), mouth ulcer (2), appetizer (1), facial spot (1), anti-icteric (1), testitis (1), uteritis (1), bladder stones (1), kidney pain (1), and amenorrhea (1).	3
49	*Artemisia scoparia* Waldst. & Kit.	Surkhak Jarub	N	HE, SE	In Pw	Urinary tract inflammation (1), antirheumatic (1), antigout (1), skin, and facial beauty (1), and for healing livestock wounds (1).	2
50	*Artemisia sieberi* Besser	Turki Boteh	N	HE, FL	In, Pw	Constipation (4), digestive (6), stomachache (14), flatulence (9), antiemetic (1), antidiarrhoeal (3),	53

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						antidysenteric (1), antidiabetic (3), wound healing (1), and antihypertensive (3).	
51	*Carthamus tinctorius* L.	Gulrang	N	FL	In	Emmenagogue (1), anti-icteric (1), antiparlytic (1), and anti-inflammatory (1).	1
52	*Centaurea pulchella* Ledeb.	Talkhak	N	HE	In	Antidiabetic (12), headache (2), blood purifier (2), antihypertensive (2), sore throat (2), dermal rashes (2), anthelmintic (3), antiemetic (1), flatulence (1), stomachache (1), antimalarial (1), heatstroke (1), sore throat (1), hepatitis (1), common cold (1), antipyretic (1), and kidney problems (2).	26
53	*Centaurea behen* L.	Bahmani Safid	I	RO	De	For constipation (1), backache (1), and as an aphrodisiac (1).	1
54	*Matricaria chamomilla* L. (*Chamomilla recutita* L.)	Guli-baboneh	N	HE, FL	In	Antipyretic (2), antiseptic (2), for stomach disorders (13), stomachache (5), and flatulence (5). Antidiarrhoeal (2), antiemetic (2), for peptic ulcer (5), digestive (2), gastritis (3), antidyspeptic (2), for hyperacidity (1), anti-inflammatory (8), for eczema (2), menstrual pains (7), as an antiseptic (1), and anti-hair loss (4).	38

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
55	*Cichorium intybus* L.	Kasni	N	RO	Mc	Hepatitis (30), anti-icteric (24), liver disorders (10), appetizer (17), typhoid (33), antipyretic (38), antimalarial (15), heatstroke (16), headache (17), antihypertensive (8), blood purifier (8), antidiabetic (9), hypolipidemic (11), stomach disorders (15), and analgesic (6).	155
56	*Cirsium vulgare* (Savi) Ten.	Yakhni- Khar	N	RO	Mc	Hepatitis (1), anti-icteric (1), antipyretic (1), and typhoid (1).	2
57	*Cousinia buphthalmoides* Regel	Laruk Khar	N	RO	De, Pw	Stomachache (1), flatulence (1), foot pain (1), hypolipidemic (1), antidiabetic (1), antirheumatic (1), nephritis (1), and cholecystitis (1).	6
58	*Arctium umbrosum* (Bunge) Kuntze (*Cousinia umbrosa* Bunge)	Palani-kharak	N	LE, RO	In, Mc	Insect bite (1) and anti-inflammatory (1).	1
59	*Cousinia chionophila* Rech. f. & Koeie	Kangar	N	LE, RO	De	Skin rejuvenation (1), diuretic (1), antipyretic (1), blood purifier (1), hepatitis (1), liver disorders (1), antirheumatic (1), antigout (1), bladder stones (1), and antiatherosclerotic (1).	2
60	*Eclipta prostrata* (L.) L.	Bangareh	N	LE, SE	In	Blood purifier (1), hair tonic (1), general tonic (1), and eye inflammation (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
61	*Helianthus annuus* L.	Guliaftabparast	N	SE	Ra	Common cold (2), antitussive (2), and antidysenteric (1).	4
62	*Helianthus petiolaris* Nutt.	Kachaluimisry	N	RO	Co	Antidiabetic (2).	2
63	*Inula rhizocephala* Schrenk	Zanjabili Shami	N	RO	De, Mc	Antiseptic (1), anti-inflammation (1), grippe (1), expectorant (1), and anthelminthic (1).	1
64	*Lactuca sativa* L.	Kahu	N	LE	Fr	Heatstroke (1), against typhoid (1), antimalarial (1), hypnotic (1), sedative (1), eye problems (1), analgesic (1), hypolipidemic (1), antihypertensive (2), blood purifier (1), stomachic (1), and source of vitamins (1).	4
65	*Tanacetum coccineum* (Willd.) Grierson (*Pyrethrum roseum* (Adams) M.Bieb.)	Makhlaseh, gulidavidi	N	HE, FL	In	Gastric ulcer (1), pneumonia (1), antitussive (1), and deodorizer (1).	2
66	*Scorzonera paradoxa* Fisch. & C.A.Mey. ex DC.	Nanak	N	RO	Fr	Edible (1)	1
67	*Senecio glaucus* L.	Gangue	N	LE	De	Antihypertensive (1) and antipyretic (2).	2
68	*Taraxacum officinale* (L.) Weber ex F.H. Wigg.	Guli Qasid	N	HE, RO	In, Ju, Mc	Liver disorders (2), constipation (1), kidney problems (2), heatstroke (1), muscle contraction (1), hypocholesterolemic (1), and antihypertensive (1).	7

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
69	*Tussilago farfara* L.	Paiekhar	N	LE	In	Anti-inflammatory (1), antitussive (1), antirheumatic (1), and vasculitis (vessel swelling) (1).	1
70	**Berberidaceae***:* *Berberis integerrima* Bunge	Zarishk, Zerk	N	LE, FU, RO	Mc, Po	Bone fracture (29), bruise (14), liver problems (5), hepatitis (7), wound healing (4), antihypertensive (9), hypolipidemic (13), anti-obesity (1), appetizer (9), choleretic (3), peptic ulcer (3), constipation (2), and heatstroke (3).	90
71	**Boraginaceae***:* *Arnebia afghanica* (Kitam.) Rech. f. & Riedl	Elehrang	N	FL, RO	De, Pw	Muscle contraction (2), antimicrobial (1), anti-inflammatory (1), burn (1), amenorrhea (1), kidney stones (1), digestive disorders (1), antidiarrhoeal (1), antidysenteric (1), nervous problems (1), and antirheumatic (1).	10
72	*Borago officinalis* L.	Gawzaban	N	FL	In, De, Pw	Kidney stones (9), nephritis (3), kidney problems (13), bladder stones (1), pain (7), heart disorders (6), nervous disorders (5), relaxing (6), pneumonia (2), dyspnea (2), rubella (1), herpes simplex (1), antirheumatic (1), abscess (1), muscle pain (1), diaphoretic (1), blood purifier (2), and flatulence (2).	44

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
73	*Trichodesma incanum* (Bunge) A. DC.	Elmity	N	LE	De, Pw	Wound healing (6), anti-inflammatory (1), acne (2), furuncle (2), dermal rashes (1), body abscess (1), heatstroke (1), bruises (1), backache (1), and general tonic (1).	14
74	**Brassicaceae**: *Lepidium sativum* L.	Tratizak	N	HE, SE	In, De, Pw	Gynecological disorders (2), antihypertensive (1), and aphrodisiac (2).	4
75	*Brassica nigra* (L.) W.D.J.Koch	Khardal	N	SE	Pw, Po	For hemorrhoid (1), and dermatitis (3).	3
76	*Brassica oleracea* L.	Karam	N	LE	Fr	Anti-obesity (1), hypolipidemic (1), aphrodisiac (1), diuretic (1), and acne (1).	3
77	*Brassica rapa* L. subsp. *rapa*	Shalgham	N	RO	Fr, Co	Bronchitis (2), antitussive (6), common cold (14), pneumonia (4), aphrodisiac (2), antidiabetic (4), flatulence (1), constipation (1), antidiarrhoeal (2).	25
78	*Brassica juncea* L.	Awri	N	SE	Pw, Gr	Anti-arthritic (1), liver and spleen pains (1), stomachache (1), poisoning (1), appetizer (1), anti-icteric (1), and skin disorders (2).	5
79	*Capsella bursa-pastoris* (L.) Medik.	Paiegungishkak	N	HE	In, Fr, Pw	Antifertility (2), stomachache (1), backache (1), diuretic (1), and anemia (1).	5
80	*Descurainia sophia* (L.) Webb ex Prantl	Khak Sheer	N	SE	Co, Mc, Pw	Antidiarrhoeal (21), constipation (21), stomachache (18), flatulence (3), antiemetic (5), appetizer (4), stomachic (2), heatstroke (14),	86

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						antipyretic (20), hepatitis (6), anti-icteric (4), typhoid (4), pneumonia (6), antitussive (6), and anti-obesity (2).	
81	*Nasturtium officinale* W.T. Aiton	Alafi Chismeh	N	HE	Fr	Hypolipidemic (1).	1
82	*Raphanus raphanistrum* L. subsp. *sativus* (L.) Domin	Mulisurkhak	N	RO	Fr	Hypolipidemic (1), anti-obesity (1), and diuretic (1).	2
83	*Raphanus raphanistrum* L. subsp. *sativus* var. *longipinnatus*	Turb	N	RO	Fr, Dp	Hearing impairment (1), hair tonic (1), and dyspnea (1).	3
84	**Burseraceae**: *Boswellia serrata* Roxb.	Kandar	I	GU	Pw	For memory enhancement (1).	1
85	**Cactaceae**: *Opuntia* dillenii (Ker Gawl.) Haw.	Zaqum, Anarizamini	I	FU	Fr	For treatment of constipation (1) and antidiabetic (1).	1
86	**Campanulaceae**: *Codonopsis clematidea* (Schrenk) C.B. Clarke	Gandehmazaq	N	LE	In	Antitussive (1), backache (1), and foot pain (1).	1
87	**Cannabaceae**: *Cannabis sativa* L.	Chars	N	RE	Sm	Relaxing (4), insomnia (4), analgesic (6), neuralgia (1), migraine (1), respiratory disorders (1), antihypertensive (2), hypolipidemic (1), amenorrhea (1), Parkinson's disease (1),	20

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						antiemetic (1), antigout (1), antirheumatic (3), pertussis (1), antituberculotic (1), seizure (1), nervous diseases (1), anti-fatigue (1), antidepressant (1), sedative (1), and antispasmodic (2).	
88	**Capparaceae**: *Capparis spinosa* L.	Kawar	N	FU, FL	In, Co, Pw	For stomachache (3), liver disorders (2), kidney disorders (4), and as an antidiarrhoeal (1).	8
89	**Caricaceae**: *Carica papaya* L.	Kharbozai-darakhti	I	FU	Fr	Diphtheria (1) and antidyspeptic (1).	1
90	**Caryophyllaceae**: *Saponaria griffithiana* Boiss.	Austooq	N	RO	Mc	Detergent for washing head (1).	1
91	**Chenopodiaceae:** *Beta vulgaris* L.	Lablabu	N	RO	Ra	Toothache (1), headache (1), and anti-hair loss (1).	1
92	*Chenopodium album* L.	Mamiran	N	HE	In	For stomachache (1), anti-icteric (1), and for constipation (1).	2
93	*Haloxylon persicum* Bunge	Saamsul	N	ST	De	For the treatment of bone fracture (1).	1
94	*Seidlitzia rosmarinus* Bunge ex Boiss.	Usnan	N	HE	De	Detergent (2), hair tonic (3), diuretic (1), abortive (1), and emmenagogue (1).	5

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
95	**Colchicaceae**: *Colchicum autumnale* L.	Suronjan	I	BU	Pi, Pw	Anticancer (1), antigout (3), analgesic (5), anti-arthritic (2), antirheumatic (2), hemorrhoid (2), and antitussive (2).	10
96	**Combretaceae**: *Terminalia chebula* Retz.	Halileh	I	FU	Ja, Mc, Pw	Against constipation (5), abdominal pain (1), gastrointestinal disorders (5), flatulence (1), headache (1), amenorrhea (1), dental tonic (1), keeping hair black (3), liver diseases (1), blood purifier (3), eye tonic (1), and memory tonic (1).	13
97	**Convolvulaceae**: *Convolvulus arvensis* L.	Pichaak	N	HE	In	Antihypertensive (6), hypolipidemic (2), antirheumatic (1), constipation (1), peptic ulcer (1), urinary disorders (4), and anti-inflammatory (2).	12
98	*Ipomoea tricolor* Cav.	Gulinilopher	N	LE, FL	In	Antitussive (3), emollient (3).	3
99	**Cucurbitaceae**: *Citrullus colocynthis* (L.) Schrad.	Tarboozi-abojihl	N	FU	De, Pw	Anthelmintic (1), constipation (6), antimicrobial (6), amoebicide (1), antidiabetic (5), diuretic (3), anti-hair loss (1), dermal diseases (1), and bile disorders (1).	16
100	*Citrullus lanatus* (Thunb.) Matsum. & Nakai (*C. vulgaris* Schrad.)	Tarbooz	N	SE	Ra	Nephritis (2).	2

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
101	*Cucumis melo* L.	Kharbozeh	N	FU	Fr	For dry skin (1), and purifier for the stomach, intestine, and bladder (1).	1
102	*Cucumis sativus* L.	Badring	N	FU	Fr	Bronchitis (1), heatstroke (2), stomach problems (1), flatulence (1), stomachache (1), typhoid (1), antimalarial (1), hypolipidemic (1), skincare (3), and general tonic (1).	6
103	*Cucurbita pepo* L.	Kadu	N	FU, SE	Ra, Co	Against prostatitis (3), urinary disorders (2), stomach disorders (3), thirst-quenching (1), memory enhancement (1), bile reflux (1), antipyretic (2), bronchitis (1), headache (2), typhoid (1), and sunburn (1).	8
104	*Momordica charantia* L.	Karileh	N	FU	Co	Antidiabetic (1).	1
105	**Elaeagnaceae**: *Elaeagnus angustifolia* L.	Sinjid	N	LE, FU, GU	In, Ra, Po	Against digestive disorders (11), antidiarrhoeal (13), antiemetic (1), flatulence (1), hypolipidemic (5), antihypertensive (3), antidiabetic (3), blood purifier (1), dermal disorders (2), anti-obesity (2), kidney disorders (5), common cold (1), nerve tonic (1), and aphrodisiac (1).	36
106	**Ephedraceae**:	Gerakaneh	N	HE	De	Antihypertensive (14), dyspnea (5), pneumonia (5), antitussive (2), wounds healing (4), stomatitis	49

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
	Ephedra gerardiana Wall. ex Klotzsch & Garcke					(3), stomachache (3), antispasmodic (1), digestive disorders (15), and mydriatic (2).	
107	**Equisetaceae**: *Equisetum arvense* L.	Dumi Asp	N	HE	De	For kidney disorders (7), nephritis (1), cystitis (1), urinary incontinence (1), gonorrhea (1), prostatitis (1), digestive (1), constipation (1), stomatitis (1), whitening, flourishing and mouth odorize (1), backache (5), and bronchitis (2).	22
108	**Ericaceae**: *Vaccinium macrocarpon* Aiton	Qaraqat i syah	I	FU	In	Antidiabetic (1) and dyspnea (1).	1
109	**Erythroxylaceae**: *Erythroxylum coca* Lam.	Boteh Kuka	I	LE	So	Local anesthetic (1) and anti-anxiety (1).	1
110	**Euphorbiaceae**: *Euphorbia granulata* Forssk.	Shirk alaf midani	N	HE	De	Anthelmintic (1), antidiarrhoeal (1), and nyctalopia (1).	1
111	*Euphorbia megalocarpa* Rech. f.	Tomakeh	N	HE, RE	De, Pa	For constipation (4), anthelmintic (1), stomachache (1), stomach cancer (1), and kidney stones (1).	7
112	*Ricinus communis* L.	Baid Anjeer	N	FO	Ms, Ra	Against food poisoning (1), constipation (3), hemorrhoid (1), anti-arthritic (1), and foot swelling (1).	4

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
113	*Abelmoschus esculentus* (L.) Moench	Bamieh	N	FU	Co, Mc	Antidiabetic (3), antitussive (1), antihypertensive (1), gastritis (1), and anti-arthritic (1).	3
114	**Fabaceae**: *Alhagi pseudalhagi* (M. Bieb.) Desv.	Shutur Khar	N	HE, RO, SA	In, De, Mc	Kidney problems (18), bladder problems (5), antidiarrhoeal (17), digestive (5), stomachache (4), flatulence (3), constipation (1), appetizer (5), hemorrhoid (1), anti-icteric (2), antidiabetic (4), against typhoid (6), hepatitis (2), antimalarial (3), heatstroke (3), antihypertensive (3), and blood purifier (2).	61
115	*Arachis hypogaea* L.	Badamizamini	N	SE	Ra	Hypolipidemic (1).	1
116	*Astragalus ajfreidii* Aitch. & Baker	Meswak	N	RO	De, Pw, Tb	Antipyretic (1), typhoid (1), body aches (1), toothache (1), gastric ulcer (1), and teeth brush (1).	3
117	*Astragalus bezudensis* Sirj. & Rech. f.	Dumi Robah	N	LE, RO	De, In, Pw	Against stomachache (1), gastritis (1), abdominal pain (1), headache (1), kidney stones (5), kidney pain (4), nephritis (6), gonorrhea (2), bone fracture (1), and wound healing (1).	13
118	*Astragalus gummifer* Labill.	Gondi Katira	I	GU	Pw	Constipation (1) and stomachic (1).	1
119	*Chamaecrista absus* (L.) H.S.Irwin & Barneby (*Cassia absus* L.)	Chaksu	I	SE	De, Pw	Measles (2), abdominal pain (2), constipation (1), antidiarrhoeal (2), antiemetics (1), common cold	7

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						(1), backache (1), bronchitis (1), nervous problems (1), and insomnia (1).	
120	*Cassia fistula* L.	Fuloos	I	FU	Mc	Against stomachache (4), constipation (8), flatulence (2), antihypertensive (1), antidiabetic (1), anti-icteric (1), aphthous stomatitis (2), and abdominal pain (2).	13
121	*Cercis siliquastrum* L.	Arghawan	N	LE	In	Antihypertensive (1) and antidysenteric (1).	2
122	*Cicer arietinum* L.	Nakhod	N	SE	Rs	For strengthening abdominal muscles (1).	1
123	*Colutea paulsenii* Freyn	Qarqeri	N	FO	Ms	For dermal diseases (1).	1
124	*Entada rheedei* Spreng.	Qursi Kamar	I	SE	De, Pw	Against backache (4), anti-arthritic (3), skin diseases (1), wound healing (1), muscle crack (1), amenorrhea (1), and flatulence (1).	5
125	*Glycine max* (L.) Merr.	Soya	I	SE, FO	Co	Kidney stones (1), kidney pain (1), mucosa protection (1), and antidepressants (1).	2
126	*Glycyrrhiza glabra* L.	Shirinboeh	N	RO	De, Pw	Against gastrointestinal disorders (50), stomachache (25), peptic ulcer (16), hyperacidity (5), gastritis (3), antitussive (18), bronchitis (10), pneumonia (6), expectorant (2), anti-inflammatory (2), nephritis (1), diuretic (2), and anti-icteric (3).	83

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
127	*Vicia lens* (L.) Coss. & Germ. (*Lens culinaris* Medik.)	Adus	N	SE	Co	Muscle tonic (1), relaxing (1), memory enhancement (1), digestive (1), and anemia (1).	1
128	*Medicago sativa* L.	Reshqeh	N	HE	In, Co Po	Against stomachache (4), peptic ulcer (1), gastritis (1), infertility (1), amenorrhea (1), anti-inflammatory (1), dermatitis (2), and muscle contusion (2).	8
129	*Melilotus officinalis* (L.) Lam.	Reshqehi-zard	N	HE	In	Anti-inflammatory (1).	1
130	*Senna alexandrina* Mill.	Senna	I	LE	De	Antiseptic (1), wound healing (1), epilepsy (1), headache (1), antirheumatic (1), hemorrhoid (1), purgative (2), anti-obesity (1), antirheumatic (1), and gastrointestinal disorders (1).	4
131	*Sophora alopecuroides* L. [var. *tomentosa* (Boiss.) Brenan]	Boieh	N	LE, RO, SE	De, Pw	Against gastric ulcer (2), stomach problems (4), antitussive (2), bronchitis (2), body aches with fever (1), and gonorrhea (1).	10
132	*Trifolium resupinatum* L.	Shabdar	N	HE, SE	Co, Fr, Mc	Against gonorrhea (1), nyctalopia (1), hemorrhoid (1), constipation (4), antihypertensive (2), hepatitis (1), anemia (1), typhoid (1), antimalarial (1), and vegetable (1).	10
133	*Trigonella foenum-graecum* L.	Hulbeh	N	SE	Pw	Against gynecological problems (10), aphrodisiac (3), lactogenic (1), antidiabetic (5), digestive (1),	18

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						flatulence (1), appetizer (5), stomachache (1), antitussive (1), anti-inflammatory (4), asthma (1), hypocholesterolemic (1), antihypertensive (1), anti-obesity (1), and foot pain (1).	
134	*Vicia faba* L.	Baquli	N	SE	Co, De	For kidney pain (1), anti-inflammatory (1), urinary tract stones (1), diuretic (1), abscesses (1), acne (1), and abdominal pain (1).	4
135	*Vicia sativa* L.	Shakhel	N	SE	Co	Peptic ulcer (1) and hyperacidity (1).	1
136	**Fagaceae**: *Quercus infectoria* G. Olivier	Sabzmazu	I	FU	De, Pw	Anorexia (1) and antidyspeptic (1).	1
137	**Fumariaceae**: *Corydalis gortschakovii* Schrenk	Darui-qurban, Mamoreh	N	HE	In, Pw	Against peptic ulcer (2), stomachache (1), dermal wounds (2), bone fracture (2), nyctalopia (1), and anti-inflammatory (1).	7
138	*Fumaria officinalis* L.	Shahtareh	N	HE	In	Dermal disorders (19), acne (13), sore throat (2), digestive disorders (10), appetizer (4), liver disorders (2), hepatitis (4), anti-icteric (3), hemorrhoid (2), amenorrhea, hypolipidemic (2), and blood purifier (4).	37
139	**Grossulariaceae**: *Ribes orientale* Desf.	Qaraqat	N	FU	De	Antihypertensive (1) and antidiabetic (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
140	**Iridaceae:** *Crocus sativus* L.	Zafran	N	ST	In	Sedative (4), antidepressant (1), insomnia (3), nervous disorders (3), vertigo (2), memory enhancement (2), epilepsy (1), aphrodisiac (7), heart disorders (3), antispasmodic (3), appetizer (1), anticancer (1), heart diseases (1), eye disorders (1), common cold (1), digestive disorders (1), flatulence (5), constipation (2), uterine bleeding (1), and antidiabetic (1).	24
141	*Iris germanica* L.	Zanbaq	N	RO	De	Antiemetic (1), flatulence (1), stomachache (1), hemorrhoid (1), RTI (2), tooth whitening (3), antidiabetic (1), anti-arthritic (1), liver pain (1), spleen pain (1), insect bites (1), and anticatarrhal (1).	5
142	**Juglandaceae**: *Juglans regia* L.	Charmaghz	N	FU, FL, BA	In, Ra, Po	Kidney diseases (2), nephritis (3), kidney stones (6), kidney pain (5), bladder stones (1), cystitis (2), hypolipidemic (16), dental whitening (7), antidiabetic (9), antihypertensive (2), leishmaniosis (2), blood purifier, common cold (3), nervous tonic (3), anti-hair loss (1), and anthelmintic (1).	47

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
143	**Lamiaceae**: *Hymenocrater sessilifolius* Benth.	Bozbash	N	HE	In, Pw Mc	Stomachache (14), digestive (2), Body aches (9), backache (2), muscle contraction (3), hepatitis, sore throat (3), typhoid (1), antimalarial (1), common cold (4), amenorrhea (2), antihypertensive (1), hypolipidemic (2), heatstroke (1), toothache (1), otitis (1), gonorrhea (1), and against the scorpion venom (1).	43
144	*Lavandula angustifolia* Mill.	Stukhudus	I	HE	In	Antidiabetic (1), cardiotonic (1) and peptic ulcer (1).	2
145	*Marrubium anisodon* K. Koch	Gazak-alaf	N	HE	De, Pw, Po	Anti-inflammatory (6), wound healing (3), stomatitis (2), gingivitis (1), dermatitis (1), emmenagogue (1), bladder stones (1), headache (1), antiemetic (1), and antiemetic (1).	13
146	*Melissa officinalis* L.	Badrinjboeh	I	HE	In	Cardiotonic (1), relaxing (1), expectorant (1), facial muscle contraction (1), nervous disorders (1), antiparlytic (1), antiseptic of mouth (1), and eyes (1).	1
147	*Mentha longifolia* (L.) L.	Podinehi-labijui	N	HE	Fr, In, Pw	Against stomachache (17), flatulence (8), antiemetic (3), digestive disorders (15),	68

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						antidiarrhoeal (8), antiemetic (4), appetizer (3), sedative (2), memory enhancement (1), nervous problems (1), antitussive (2), sore throat (2), dyspnea (1), kidney disorders (3), rheumatic pains (4), antipyretic (2), antidiabetic (3), antihypertensive (6), hypolipidemic (5), spice (4), heatstroke (2), and for losing weight (1).	
148	*Mentha piperita* L.	Nana	N	HE	Fr, In, Pw	Against stomachache (8), digestive (4), stomachic (5), flatulence (15), antispasmodic (4), appetizer (2), antiemetic (4), antiemetic (1), headache (1), antihypertensive (2), antiatherosclerotic (1), toothache (3), common cold (4), antitussive (2), headache (1), antiseptic (1), wounds healing (1), and as a spice (2).	40
149	*Nepeta bracteata* Benth.	Kakoti	N	HE	In, Pw	Digestive (1), carminative (1), antidiarrhoeal (1), headache (1), foot pain (1), analgesic (1), antipyretic (1), common cold (1), asthma bronchial (1), aid blood circulation (1), antidiabetic (1), and spice (1).	8

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
150	*Nepeta glutinosa* Benth.	Azhdumboteh	N	FL	In	Backache (6), bone fracture (16), contusion (3), analgesic (14), anti-arthritic (4), nephritis (1), antirheumatic (3), diaphoretic (1), antihypertensive (2), hypolipidemic (1), antidiabetic (2), and anti-obesity (1).	33
151	*Nepeta juncea* Benth.	Gorbakhurak	N	HE	In, Pw	Against flatulence (3), antispasmodic (1), stomachache (2), digestive (3), headache (2), sedative (1), insomnia (2), nervous problems (2), analgesic (12), backache (3), amenorrhea (4), menstruation (2), anti-arthritic (7), infertility (6), abortive (1), hemorrhoids (1), gonorrhea (1), anti-inflammatory (4), common cold (1), and antibacterial (1).	30
152	*Nepeta podostachys* Benth.	Podinehi Asp	N	HE	In, Pw	Sedative (1), diaphoretic (1), muscle pain (3), and headache (1).	3
153	*Nepeta pubescens* Benth.	Kharpudineh	N	RO	Mc	Against nasal bleeding (1).	1
154	*Ocimum basilicum* L.	Rayhan	N	HE	Fr, In, Pw	Antidepressant (1), nervous tonic (6), vertigo (1), sedative (5), hypnotic (2), headache (3), migraine (3), neurological diseases (3), gastrointestinal diseases (13), antidiarrhoeal (1), antispasmodic	22

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						(4), pertussis (1), sore throat (2), grippe (1), antipyretic (1), amenorrhea (3), general tonic (1), diuretic (1), and lactogenic (2).	
155	*Origanum vulgare* L.	Hazawol	N	HE	In	Antiviral for mumps, red inflamed breast (2), and dermal sensitivity (2).	2
156	*Salvia yangii* B.T. Drew (*Perovskia atriplicifolia* Benth.)	Khangi	N	FL	In, Pw	Analgesic (6), amenorrhea (3), wound healing (1), antimicrobial (1), antipyretic (3), anti-icteric (1), foot pain (3), flatulence (3), stomachache (2), antispasmodic (2), common cold (6), and anti-inflammatory (2).	18
157	*Prunella vulgaris* L.	Stukhudus	N	HE	In	Stomachic (2), flatulence (1), stomachache (1), antirheumatic (2), scabies (1), nervous disorders (1), and dermal diseases (2).	6
158	*Salvia rosmarinus* Spenn. (*Rosmarinus officinalis* L.)	Eklilikohi	I	LE	De	Antiseptic (1), antidiarrhoeal (1), antitussive (1), antispasmodic (1), antipyretic (1), digestive disorders (1), antirheumatic (2), sedative (1), and diaphoretic (1).	2
159	*Salvia sclarea* L. (*Salvia haematodes* Scop.)	Bahmani Surkh	N	HE, RO	De, Pw	Against backache (2), foot pain (1), general tonic (3), cardiotonic (1), stomachic (2), wound healing	5

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						(1), anti-icteric (1), bladder problems (1), and aphrodisiac (1).	
160	*Salvia macrosiphon* Boiss.	Kanawcheh	N	HE, SE	De, Pw	Antitussive (3), bronchitis (2), dermal acne (3), wound healing (1), and digestive disorders (2).	9
161	*Salvia officinalis* L.	Marimguli	I	HE	In	RTI (1), antidyspeptic (1), antibacterial (1), and anti-sweat (1).	1
162	*Salvia rhytidea* Benth.	Gandeh-baghal	N	HE	De	For headaches (2), backache (2), pneumonia (6), antitussive (3), for bronchitis (3), stomachache (8), digestive (3), for peptic & duodenal ulcer (1), antirheumatic (1), anti-inflammatory (2), antidiabetic (1), antibacterial (1), and antihypertensive (1).	25
163	*Phlomidoschema parviflora* (Benth.) Vved. (*Stachys parviflora* Benth.)	Paduleh	N	HE	De	Against stomachache (2), constipation (1), hemorrhoid (1), anti-infertility (1), childbirth bleeding (2), menstrual pain (1), contusion (3), dermal disorders (1), antihypertensive (3), antidiabetic (2), hypolipidemic (1), and antirheumatic (1).	14

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
164	*Ziziphora clinopodioides* Lam. subsp. *afghanica* (Rech. f.) Rech. f. in Rech.	Jambilak, Kakoti, Chaiekohi	N	HE	In	Antihypertensive (5), hypolipidemic (4), stomachache (6), flatulence (3), appetizer (3), peptic ulcer (1), gastritis (1), foot pain (2), common cold (3), antipyretic (1), backache (2), amenorrhea (1), menstrual infection (2), antimicrobial (1), antiseptic, respiratory tracts infection (3), and antiviral (1).	21
165	*Ziziphora tenuior* L.	Kakoti	N	HE	In, Pw	Against stomach disorders (1), flatulence (1), appetizer (1), antidiabetic (1), antihypertensive (1), hypolipidemic (1), general tonic (1), common cold (1), and inflamed wounds (1).	8
166	**Lauraceae**: *Cinnamomum verum* J. Presl (*C. zeylanium Blume*)	Darchini	I	BA	De, Pw	General tonic (3), stimulant, sexual tonic (3), heart disorders (4), hypolipidemic (6), antidiabetic (2), analgesic (2), antidyspeptic (2), antidiarrhoeal (4), heart failure (1), flatulence (3), antihaemorrhagic (1), wound healing (4), anti-arthritic (2), acne (3), and antirheumatic (1).	21
167	**Liliaceae:** *Fritillaria imperialis* L.	Shamangul	N	FL	In	Cardiotonic (1) and kidney stones (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
168	*Lilium candidum* L.	Gulisusan	I	HE, PE	In, Pa	For dermal abscess (1), antiseptic (1), burns (1), muscle tonic (2), aphrodisiac (1), nephritis (1), gonorrhea (1), bronchitis (1), hemorrhoid (1), and laxative (1).	4
169	**Linaceae:** *Linum usitatissimum* L.	Zighier	N	SE, FO	Mc, Ms	Antitussive (3), dermatitis (2), constipation (4), pneumonia (1), general tonic (1), and bone fractures (1).	5
170	**Lythraceae:** *Lawsonia inermis* L.	Khineh	N	LE	Pa	Wound healing (1), analgesic (1), antirheumatic (1), foot cracks (1), and cosmetic (2).	3
171	**Malvaceae:** *Althaea officinalis* L.	Khatami	N	FL, RO	In, De	For respiratory disorders (5), bronchitis (14), antitussive (34), sore throat (12), common cold (18), pneumonia (21), stomachache (4), constipation (8), and gingivitis (1).	95
172	*Gossypium hirsutum* L.	Punbadaneh	N	FO, CA	Po	Against abscess (2), warts (1), inflamed wounds (1), anti-arthritic (1), anti-anxiety (1), testesitis (1), anti-infertility (1), and memory enhancement (1).	3
173	*Hibiscus sabdariffa* L.	Chai Mackie	N	CX	De	Antihypertensive (1).	1
174	*Malva neglecta* Wallr.	Panirak	N	HE, RO	Fr, In	Anti-inflammatory (8), wound healing (2), antitussive (14), bronchitis (4), sore throat (17),	47

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						common cold (2), heatstroke (7), antipyretic (7), digestive (1), peptic ulcer (1), constipation (7), abdominal pain (5), antidiarrhoeal (3), hemorrhoid (1), diuretic (1), cystitis (1), nephritis (1), dermal disorders (8), demulcent (1), conjunctivitis (1), and amenorrhea (1).	
175	**Moraceae** *Ficus carica* L.	Anjeer	N	FU	Fr, De, Dy	Flatulence (1), hyperacidity (1), constipation (3), appetizer (3), memory enhancement (3), fatigue (1), autoerotism (1), aphrodisiac (1), dyspnea (1), pertussis (3), common cold (1), antitussive (4), pneumonia (3), antihypertensive (2), and anti-atherosclerotic (1).	16
176	*Morus alba* L.	Toot	N	FU	Fr, Dy	Antidiabetic (1) and antihypertensive (1).	2
177	*Morus nigra* L.	Shah Toot	N	FU	Fr, Dy, Pw	Antihypertensive (1), hypolipidemic (2), blood purifier (2), anemia (2), sore throat (1), antidiabetic (1), typhoid (1), heatstroke (1), antidiarrhoeal (1), antirheumatic (1), and gonorrhea (1).	8
178	**Myristicaceae** *Myristica fragrans* Houtt.	Jawz	I	FU	Dy	Carminative for pregnant women and children (2).	2

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
179	**Myrtaceae** *Eucalyptus globulus* Labill.	Geitis	N	LE	De	Antipyretic (1), appetizer (1), digestive (1), antidiarrhoeal (1), antidiabetic (1), bronchitis (1), cystitis (1), wound healing (1), vaginal irritation (1), relaxing (1), vertigo (1), mouthwash (1), antiseptic (1), antibacterial (1), anti-inflammatory (1), respiratory disorders (1), and expectorant (1).	2
180	*Myrtus communis* L.	Manu	N	LE	Sm	Sedative (1), nervous disorders (1), and headache (1).	2
181	*Syzygium aromaticum* (L.) Merrill & L.M. Perry	Gulimikhak	I	FL	De, Pw	Hypolipidemic (2), antidiabetic (2), toothache (5), stomatitis (1), antirheumatic (2), antituberculotic (1), stomachache (3), digestive (1), hyperacidity (2), flatulence (1), antidyspeptic (1), abdominal cramps (1), brain tonic (3), anti-anxiety (1), amenorrhea (1), neuralgia (1), appetizer (1), antiseptic (1), and contraception (2).	16
182	**Oleaceae** *Fraxinus xanthoxyloides* (G. Don) Wall. ex A.DC.	Shing	N	LE, FL, RO	In, Pw	Antigout (1), antirheumatic (1), stomach and liver-spleen disorders (1), appetizer (1), purgative (1), general tonic (2), antipyretic (1), antitussive (1), diuretic (1), and dermal problems (2).	2

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
183	*Olea europaea* L.	Zaitone	N	LE, FU, FO	Fr, In, Ms	Antihypertensive (9), hypolipidemic (2), antidiabetic (3), antirheumatic (4), body lotion (3), anti-rachitic (1), diuretic (1), liver disorders (1), bile stones (2), and sore throat (1).	14
184	**Papaveraceae** *Glaucium flavum* Crantz	Khirs kandeh	N	LE	In, Pw	Wound healing (5), blood purifier (1), and antiemetic (1).	6
185	*Papaver dubium* L.	Tariyaki Kohi	N	FU	De	Common cold (2), antihypertensive (1), analgesic (1), stomachache (2), and peptic ulcer (1).	4
186	*Papaver pavoninum* Schrenk	Shaqaiq, Gulinazukak, Gulidukhtaran	N	FL	In	Analgesic (3), toothache (1), hypnotic (1), nervous tonic (1), dysuria (1), bronchitis (3), common cold (2), antitussive (1), sore throat (1), hypnotic (1), constipation (1), and leishmaniasis (1).	10
187	*Papaver somniferum* L.	Koknar	N	RE, FU, SE	De, Pw, Dy	Analgesic (12), hypnotic (7), sedative (4), antidiarrhoeal (3), antiemetic, antitussive (8), bronchitis (2), pneumonia (2), anticatarrhal (1), and for reduction of libido (2).	21
188	**Pedaliaceae**: *Sesamum indicum* L.	Konjed	N	SE, FO	Co, Mc	Relive paralytic organ (2), heart problems (1), antihypertensive (2), antiatherosclerotic (2), antispasmodic (2), hoarseness (1), vertigo (1), migraine (1), anti-obesity (1), and aphrodisiac (1).	3

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
189	**Piperaceae**: *Piper nigrum* L.	Morchi syah	I	FU	Pw	Appetizer (3), digestive disorders (1), flatulence (3), antispasmodic (1), antitussive (1), stomatitis (1), antimicrobial (1), anti-inflammatory (1), analgesic (1), anti-arthritic (1), and as a spice (1).	6
190	**Plantaginaceae**: *Plantago lanceolata* L.	Shinaru	N	LE	In, Po	Against sore throat (15), pharyngitis (1), antitussive (1), antidiarrhoeal (4), digestive disorders (4), stomachache (2), flatulence (1), mouth inflammation (1), common cold (1), influenza (2), fever (3), and heatstroke (4).	31
191	*Plantago major* L.	Danehzoof	N	SE	Co, De, Mc, Po	Against constipation (19), stomachache (20), antidiarrhoeal (4), pneumonia (18), bronchitis (9), sore throat (8), expectorant (4), antitussive (13), wound healing (8), dermal rashes (8), baby feeding (5), influenza (3), heatstroke (4), hypolipidemic (1), and antihypertensive (1).	94
192	*Plantago ovata* Forssk.	Spaghul	I/N	HU	Mc	Against constipation (1), stomachache (2), antidiarrhoeal (1), antiemetic (1), and antipyretic (1).	2
193	*Plantago indica* L. (*P. psyllium* L.)	Esfarzeh	N	SE	Mc	Against stomachache (10), peptic ulcer (4), digestive disorders (10), antidiarrhoeal (2),	36

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						hemorrhoid (1), antitussive (5), expectorant (1), heatstroke (6), antipyretic (4), and hypocholesterolemic (1).	
194	**Platanaceae**: *Platanus orientalis* L.	Panjachinar	N	BA	De	Kidney stones (1) and analgesic (1).	1
195	**Pleurotaceae:** *Pleurotus eryngii* (DC.) Quél.	Samruq	N	TA	Co, Pw	Antidiarrhoeal (5), constipation (3), anthelmintic (7), stomachache (2), flatulence (1), and general tonic (1).	17
196	**Poaceae:** *Elymus repens* (L.) Gould (*Agropyron repens* (L.) P. Beauv.)	Kabal	N	HE, RO	De	Against kidney and bladder stones (5), Kidney pain (5), nephritis (1), gallstones (1), gonorrhea (1), prostatitis (1), kidney problems (1), antidiabetic (1), hepatitis (1), and antihypertensive (1).	11
197	*Avena sativa* L.	Moieh Jaw	N	SE	De, Pa	Antigoiterogenic (1), face wrinkle (1), gallstones (2), kidney disorders (3), and antihypertensive (1).	6
198	*Hordeum vulgare* L.	Cal Jaw	N	SE	Co, Be	Against nephritis (3), kidney stones (2), cystitis (2), antidiabetic (3), stomach disorders (5), anemia (2), antihypertensive (1), aphrodisiac (1), antipyretic (1), liver disorders (3), anti-obesity (1), and lactogenic (1).	7

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
199	*Oryza sativa* L.	Bringe	N	SE	Co	Stomachic (1) and blood purifier (1).	1
200	*Panicum miliaceum* L.	Arzen	N	SE	Mc, Pw	Against gonorrhea (1), antihypertensive (1), antidiarrhoeal (1), blood purifier (1), antidepressant (1), antiseptic (1), and for preventing abortion (1).	3
201	*Phragmites australis* (Cav.) Trin. ex Steud. (*P. communis* Trin.)	Lukh	N	RO	Mc	Antihypertensive (1).	1
202	*Saccharum officinarum* L.	Naishakar	N	SM	Ju	Antihyperglycemic (2), kidney pain (1), and hepatitis (1).	3
203	*Secale cereale* L.	Jawder	N	SE	Pw	For childbirth (1) and abortive (1).	1
204	*Triticum aestivum* L.	Gandom	N	SE	Fr, Po	Against anemia (2), general tonic (3), and stomatitis (1).	3
205	*Zea mays* L.	Jawari	N	ST	In, Co	To expel kidney stones (8), for kidney pain (7), nephritis (8), kidney disorders (5), diuretic (1), for UTI (2), antidiabetic (3), antihypertensive (2), for nasal bleeding (1), against heatstroke (1), and for stomachache (1).	34
206	**Polygonaceae**: *Polygonum aviculare* L.	Haft band	N	HE	In, Po	Against contusion (1), wound healing (1), for sore throat (1), antipyretic (1), antihaemorrhagic (1),	5

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						for kidney stones (1), antidysenteric (2), and for pneumonia (1).	
207	*Koenigia coriaria* (Grig.) T.M.Schust. & Reveal (*Polygonum bucharicum* Grig.)	Chukriahu	N	RO	De, Po	Analgesic (1), antihypertensive (3), antidiarrhoeal (3), peptic ulcer (2), antiemetic (1), digestive (1), gingivitis (1), and stomatitis (3).	12
208	*Persicaria hydropiper* (L.) Delarbre (*Polygonum hydropiper* L.)	Morchiabie	N	LE	Fr	Styptic (1).	1
209	*Rheum ribes* L.	Chukri	N	RO, PT	Fr, Pw	Against constipation (2), antidysenteric (1), abdominal pain (1), antiemetic (1), hypolipidemic (4), antihypertensive (4), antidiabetic (3), bronchitis (1), common cold (1), vitamin deficiency (1), anemia (2), heatstroke (1), bruises (2), vegetable and food (1).	22
210	*Rumex crispus* L.	Shilkheh	N	LE, RO	De, Mc	Laxative (6), emollient (1), stomachic (2), hypolipidemic (2), antihypertensive (1), hepatitis (1), bile disorders (2), anti-inflammatory (1), toothache (1), dermal rashes (2), wound healing (1), antipyretic (2), pneumonia (1), and dyspnea (1).	25

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
211	**Portulacaceae**: *Portulaca oleracea* L.	Khurfeh	N	HE	Co	Against constipation (3), anemia (2), anorexia (1), migraine (1), vertigo (2), typhoid (1), antimalarial (1), diuretic (1), heatstroke (1), memory enhancement (1), nervous problems(1), taeniacid (1), anti-infectious (1), anti-inflammatory (1), liver diseases (1), anti-icteric (1), antidiabetic (1), general tonic (1), toothache (1), sore throat (1), and kidney problems (2).	12
212	**Primulaceae**: *Dionysia tapetodes* Bunge	Gulikamar	N	FL	In	Antirheumatic (1) and stomach problems (1).	2
213	*Primula pamirica* Fed.	Gulibenafsheh	N	HE	In, De	Respiratory tract inflammation (2), sore throat (1), bronchitis (2), tonic (1), gastroenteritis (2), purgative (1), sedative (2), and antidepressant (1).	2
214	**Punicaceae**: *Punica granatum* L.	Annar	N	FU, PE	Fr, Pw	Anthelmintic (7), antidiabetic (2), hypolipidemic (4), anemia (3), nasal bleeding (3), hemorrhoid (1), antidiarrhoeal (26), stomachache (2), liver tonic (1), appetizer (1), and peptic ulcer (1).	39
215	**Ranunculaceae**: *Aconitum rotundifolium* Kar. & Kir.	Gurgkosh	N	RO, LE	Pw	Nervous problems (1), antirheumatic (1), and antigout (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
216	*Nigella sativa* L.	Syahdaneh	N	SE	De, Pw	Against flatulence (4), stomachache (6), laxative (2), GI infection (1), lactogenic (4), anti-inflammatory (4), antidiabetic (7), hypolipidemic (4), antitussive (3), anthelmintic (2), kidney disorders (7), anti-hair loss, and nervous disorders (2).	27
217	*Ranunculus olgae* Regel (*R. afghanicum* Aitch. & Hemsl.)	Shorvagulak	N	FL, HE	In, Pw	Anthelmintic (2), stomachache (2), constipation (2), antitussive (2), typhoid (1), and measles (1).	9
218	**Rhamnaceae**: *Zizyphus spina-christi* (L.) Desf.	Sedir	N	LE	De	Detergent for washing body or hair.	1
219	*Ziziphus jujuba* Mill.	Unab	N	FU	Ra	Hypolipidemic (3), cardiotonic (1), sedative (4), antiatherosclerotic (1), antihypertensive (2), anti-anxiety (1), restlessness (1), antidiabetic (2), bronchitis (4), blood purifier (2), dental care (1), and digestive disorders (1).	11
220	**Rosaceae**: *Amygdalus communis* L.	Badam	N	SE, FO	Ra	Nervous tonic (6), aphrodisiac (3), relaxing (3), nervous disorders (1), emollient (1), stomachic (2), and laxative (1).	10
221	*Amygdalus communis* [var. *amara*]	Badam e talkh	N	SE, FO	Ra	Relaxing (1), migraine (1), common cold (1), antidiabetic (1), and dermal rashes (1).	4

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
222	*Prunus koelzii* (Browicz) A.E.Murray (*Amygdalus koelzii* Browicz)	Qarghaneh	N	FO	Co	Antidiabetic (2).	2
223	*Crataegus songarica* K. Koch.	Dulaneh	N	LE, FL, FU	In, Fr	For heart problems (4), antihypertensive (3), hypolipidemic (4), stomachache (3), hyperacidity (1), antidiarrhoeal (1), antiemetic (1), nervous tonic (1), leishmaniosis (1), antipyretic (1), antidiabetic (1), anti-icteric (1), and sore throat (1).	13
224	*Cydonia oblonga* Mill.	Bihie	N	FU	De	Antitussive (5), for bronchitis (9), pneumonia (6), anticatarrhal (1), gastroenteritis (1), antidiarrhoeal (2), agaisnts heatstroke (2), fatigue (1), sore throat (1), and hoarseness (1). Antipyretic (1), aphrodisiac (1), wound healing (1), for burn (1), anti-icteric (1), for intestinal disorders (1), depression (1), hemorrhoid (1), and dysuria (1).	16
225	*Filipendula vestita* (Wall. ex G. Don) Maxim.	Daduff	N	LE	In	Antiemetic (1).	1
226	*Fragaria* × *ananassa* Duchesne	Tooti-zamini	N	FU	Fr	Antidiabetic (1).	1

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
227	*Malus domestica* Borkh.	Sieb	N	FU, LE	Fr, In	Against herpes simplex (2), cardiotonic (4), anti-arthritic (2), antirheumatic (3), antigout (2), anti-obesity (2), blood purifier (2), lung diseases (2), antiatherosclerotic (3), kidney disorders (2), liver tonic (2), anemia (2), antidyspeptic (1), tonic (1), diuretic (1), and anthelmintic (1).	12
228	*Prunus armeniaca* L.	Zardallu	N	FU, GU	De, Fr, Pw	Against backache (4), antirheumatic (1), body aches (1), anti-arthritic (1), hepatitis (1), anticatarrhal (1), anemia (1), dermal beauty (1), hoarseness (1) and heart problems (1).	7
229	*Prunus cerasus* L.	Alubalu	N	PT, FU	De, Fr	Against kidney disorders (40), urinary tract diseases (7), diuretics (1), anemia (1), heatstroke (1), hepatitis (3), liver disorders (4), blood purifier (4), and hypolipidemic (4).	58
230	*Prunus domestica* L.	Alubokhara	N	FU	Fr, Ju	Appetizer (2), anti-icteric (2), choleric (1), liver tonic (2), heatstroke (1), antiemetic (2), anti-anxiety (1), depression (1), backache (1), stomachache (1), and blood purifier (1).	10
231	*Prunus microcarpa* C.A. Mey.	Chakehdaneh	N	FU, SE	Fr, Pw	Kidney disorders (2), constipation (1), stomachache (3), hepatitis (1), and sedative (1).	7

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
232	*Prunus persica* (L.) Batsch	Shaftalu	N	GU, LE, SE	Ju, Pw	Against aphthous ulcers in livestock (4), disinfectant (1), anthelmintic (1), hemorrhoid (1), anti-arthritic (1), and backache (1).	13
233	*Pyrus communis* L.	Naak	N	FU	Ju	Against skin problems (3), respiratory, and gastric problems (1).	2
234	*Rosa beggeriana* Schrenk.	Khari Tarani	N	FU, GU	De, Ra	Against kidney pain (3), antirheumatic (1), antispasmodic (1), constipation (1), and *H. pylori* infections (1).	7
235	*Rosa canina* L.	Nastran	N	FU	Mc, Ra	Against typhoid (3), hepatitis (2), anti-icteric (1), antihypertensive (1), hypolipidemic (2), aphthous stomatitis (1), mouth drought (1), anemia (1), and general tonic (1).	9
236	*Rosa damascena* Herrm.	Guligulab	N	FL	In	Against stomachache (7), stomach problems (11), constipation (4), antidiarrhoeal (2), flatulence (3), antihypertensive (1), antitussive (4), bronchitis (3), dyspnea (2), hepatitis (1), headache (2), amenorrhea (1), acne (1), and anti-hair loss (1).	30
237	*Rosa foetida* Herrm.	Kharisurkhaku	N	GU	Ch	Antitussive (1), for bronchitis (1), and antidiarrhoeal (1).	2

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
238	*Rubus caesius* L.	Bodirgan	N	FU	Fr	Hypolipidemic (1), kidney pain (1), and antidiarrhoeal (1).	4
239	**Rubiaceae**: *Cinchona pubescens* Vahl	Kangineh	I	BA	Mc	General tonic (1), antipyretic (1), antidiarrhoeal (1), and appetizer (1).	1
240	*Coffea arabica* L.	Qahweh	I	SE	In	Relaxing (2), memory enhancement (1), heart, and respiratory stimulants (1).	2
241	**Rutaceae**: *Citrus* × *aurantium* L. (*C. reticulata* Blanco)	Kino	N	LE, FL, PE	In, De	Antidyspeptic (1), convalescence (1), insomnia (1), anti-anxiety (1), and nervous problems (1).	1
242	*Citrus* × *aurantium* L. [var. *amara*]	Naringe	N	LE, FL, FU	In, Fr	Nerve tonic (4), antihypertensive (1), appetizer (1), antidiabetic (1), hypocholesterolemic (2), digestive problems (5), pneumonia (1), and styptic (1).	9
243	*Citrus limon* (L.) Osbeck	Limu	N	FU	Fr, Ju	Against acne (2), dermal beauty (2), antidiarrhoeal (2), kidney stones (1), antirheumatic (1), anemia (1), and diaphoretic (1).	8
244	**Salicaceae**: *Populus alba* L.	Chinar	N	BA, LE	De, Po	Antidiarrhoeal (1), snakebite (1), antitussive (1), hoarseness (1), pneumonia (1), dyspnea (1), anti-arthritic (1), antipyretic (2), abscess (1), and dermal disorders (1).	4

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
245	*Salix spp.* (*S. alba* L.; *S. excelsa* S.G. Gmel. incl. var. *rodinii* A. Skvortzov; *S. pycnostachya* Andersson)	Baid	N	LE, BA, RO	De, Cv	Antipyretic (15), analgesic (4), headache (5), migraine (2), antirheumatic (1), eye pain (2), typhoid (5), antimalarial (5), heatstroke (13), common cold (1), pneumonia (1), and antidiarrhoeal (3).	40
246	**Scrophulariaceae:** *Digitalis purpurea* L.	Guliangushtaneh	I	FL	In	Against heart diseases (1), antihypertensive (1), diuretic (1), cardiotonic (1), and antirheumatic (1).	1
247	*Verbascum thapsus* L.	Gushikharak	N	LE, FL	In, Po	Anti-inflammatory (5), antidiarrhoeal (3), flatulence (2), abdominal pain (1), hemorrhoid (1), respiratory disorders (3), antidiabetic (1), infertility (3), anti-icteric (2), antiseptic (1), acne (2), anti-arthritic (1), and bone fracture (2).	21
248	**Solanaceae**: *Atropa belladonna* L.	Shahbizak	I	HE	In, Pw	Against pertussis (1), nervous disorders (2), abdominal pain (2), epilepsy (1), vertigo (1), backache (1), amenorrhea (1), hemorrhoid (1), diaphoretic (1), and anti-tremor (1).	2
249	*Capsicum annuum* L.	Morch	N	FU	Fr, Pw	Antirheumatic (2), appetizer (2), and antidiabetic (1).	4
250	*Capsicum annuum* Group	Morchi Shirin	N	FU	Fr, Pw	Antimicrobial (2), cardiotonic (1), toothache (2), antidiabetic (2), and digestive (1).	2

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
251	*Datura stramonium* L.	Datureh	N	LE	In, Sm, Pw, Ti	Against dyspnea (2), antitussive (1), RTI, analgesic (3), stimulant (1), antispasmodic (1), antidiarrhoeal (1), anorexia (1), antirheumatic (1), relaxing (1), antipyretic (1), common cold (1), anti-inflammatory (1), and against poisoning (1).	10
252	*Hyoscyamus niger* L.	Bangak-diwaneh	N	HE	De	Against toothache (1).	1
253	*Hyoscyamus senecionis* Willd.	Jilgaw	N	HE	De	Abdominal pain (1), gonorrhea (1), headache (1), and dry mouth (1).	2
254	*Nicotiana tabacum* L.	Tanbaku	N	LE	Ju, Pa	Against toothache (1), insecticide (1), and anti-inflammatory (1).	2
255	*Solanum lycopersicum* L.	Badinjanirumi	N	FU	Fr, Po	Diuretic (1), antidiarrhoeal (1), hemorrhoid (1), demulcent (1), burn (1), anti-inflammatory (1), anemia (1), antidiabetic (1), hypolipidemic (1), and antihypertensive (1).	2
256	*Solanum nigrum* L.	Angoor-sagak	N	FU, LE	Fr, In, Sm	Against stomachache (3), constipation (1), gastritis (1), antidiarrhoeal (1), fever (3), antirheumatic (1), urticaria (1), sore throat (1), nephritis (1), and microbial wounds (1).	11
257	*Solanum tuberosum* L.	Kachilu	N	TU, FL	In, Po	For burns (4), common cold (2), and hypnotic (1).	8

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
258	*Withania coagulans* (Stocks) Dunal	Panirband	N	FU	De, Mc	Antihypertensive (1), hypolipidemic (2), Anti-icteric (1), pneumonia (1), hair tonic (1), stomachache (1), antidiabetic (1), and making cheese (1).	5
259	**Tamaricaceae**: *Tamarix ramosissima* Ledeb.	Gaz	N	FL	In	Toothache (2), nephritis (1), and anti-infertility (1).	4
260	**Theaceae**: *Camellia sinensis* (L.) Kuntze	Chai	I	LE	In	Hypolipidemic (1), for heart diseases (1), antihypertensive (3), antiatherosclerotic (1), blood purifier (1), antidiabetic (1), relaxing (2), diuretic (3), cardiotonic (1), stimulant (2), antidiarrhoeal (2), for digestive diseases (4), conjunctivitis (5), antioxidant (2), bronchitis (1), and headache (1).	10
261	**Ulmaceae**: *Ulmus minor* Mill.	Pasha Khaneh	N	RO	Pw	For dermal diseases (2).	2
262	**Urticaceae**: *Urtica dioica* L.	Sokhtanak	N	HE	De	Against gonorrhea (19), kidney & bladder disorders (13), diuretic (7), prostatic hyperplasia (3), antidiabetic (3), antihypertensive (2), hemorrhoid (4), flatulence (2), antidiarrhoeal (2), anti-arthritic (3), and antirheumatic (3).	52

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
263	**Verbenaceae**: *Verbena officinalis* L.	Shahpisand	N	FL	In	Antipyretic (1), antimalarial (1), antidyspeptic (1), sore throat (1), wound healing (1), liver disorders (1), and nephritis (1).	1
264	**Vitaceae**: *Vitis vinifera* L.	Angor	N	FU, LE, TE	Fr, Mc, Po	Against kidney problems (4), heatstroke (3), antipyretic (1), sore throat (1), cardiovascular disorders (3), anemia (1), general tonic (1), flatulence (1), stomachache (1), and antidiarrhoeal (1).	19
265	**Zingiberaceae:** *Curcuma longa* L.	Zardchobeh	I	RH	Pw, Pa	Digestive disorders (6), flatulence (6), appetizer (2), stomachic (1), liver disorders (1), bone fracture (4), bruise (3), analgesic (7), antipyretic (1), blood purifier (1), anticoagulant (1), and antimicrobial (1).	27
266	*Curcuma aromatica* Salisb. (C. *zedoaria* Roxb.)	Narkichor	I	RH	Pw, Pa	Stomachache (3), flatulence (1), constipation (1), appetizer (1), hemorrhoid (1), antirheumatic (1), heatstroke (2), sore throat (1), amenorrhea (2), foot and hand pain (1).	11
267	*Elettaria cardamomum* Maton	Hiel Chai	I	FU, SE	In	For headache (1), hypolipidemic (1), digestive (3), flatulence (4), hyperacidity (1), stomachache (4), antirheumatic (1), throat and ear diseases (1),	9

#	Family/Scientific name	Local name	OR	PU	PR	Use (number of use reports)	FQ
						mouth ulcers (1), kidney, and bladder problems (2).	
268	*Zingiber officinale* Roscoe	Zanjabil	I	RH	Pw, In, De, Po	For flatulence (16), abdominal pain (7), appetizer (7), stomachache (2), antiemetic (2), constipation (2), digestive (1), hemorrhoid (1), sore throat (4), common cold (2), bone pain (2), myalgia (1), antihypertensive (2), headache (2), backache (4), anti-arthritic (4), foot pain (3), antirheumatic (6), amenorrhea (2), aphrodisiac (2), and dermatitis (1).	37
269	**Zygophyllaceae**: *Peganum harmala* L.	Espand	N	FU	De, Sm	Antiseptic (5), analgesic (10), hypnotic (1), the evil eye (7), flatulence (7), constipation (6), toothache (3), antimicrobial (9), stomachache (2), menorrhagia (1), anti-inflammatory (3), acne (1), and uterus pain (1).	44
270	*Tribulus terrestris* L.	Khari Mughilan	N	HE, FU	De, Pw	Against kidney disorders (12), cystitis (1), urinary tract stones (1), aphrodisiac (2), gonorrhea (2), peptic ulcer (1), antihaemorrhagic (2), stomachache (1), and constipation (1).	20

Table abbreviations:- I: imported; N: native; FQ: frequency; OR: origin; PU: part used; PR: preparations; Be: beverage; Co: cooked; Cv: covering; Ch: chewing; De: decoction; Dp: drop; Dy: dry; Fr: fresh; FO: fatty oil; Gr: grinding; In: infusion; Ja: Jam; Ju: juice; Mc: maceration; Ms: massage; Pa: paste; Pi: pill; Po: poultice; Pw: powder; Ra: raw; Rs: roasted; Ru: rub; Sm: smoke; So: solution; Ti: tincture; Tb: teeth brush.

The analysis of the data shows that in the study area a total of 270 medicinal plant species are applied for medicinal purposes. These plants belong to 76 families and the most represented families are Asteraceae (10%), followed by Fabaceae (8%), Lamiaceae (8%), Apiaceae (8%), Rosaceae (7%), Solanaceae, Brassicaceae and Poaceae (4% each) (Figure 24), whereas 68 families are the least represented among the recorded plants, having 6 or less than 6 species.

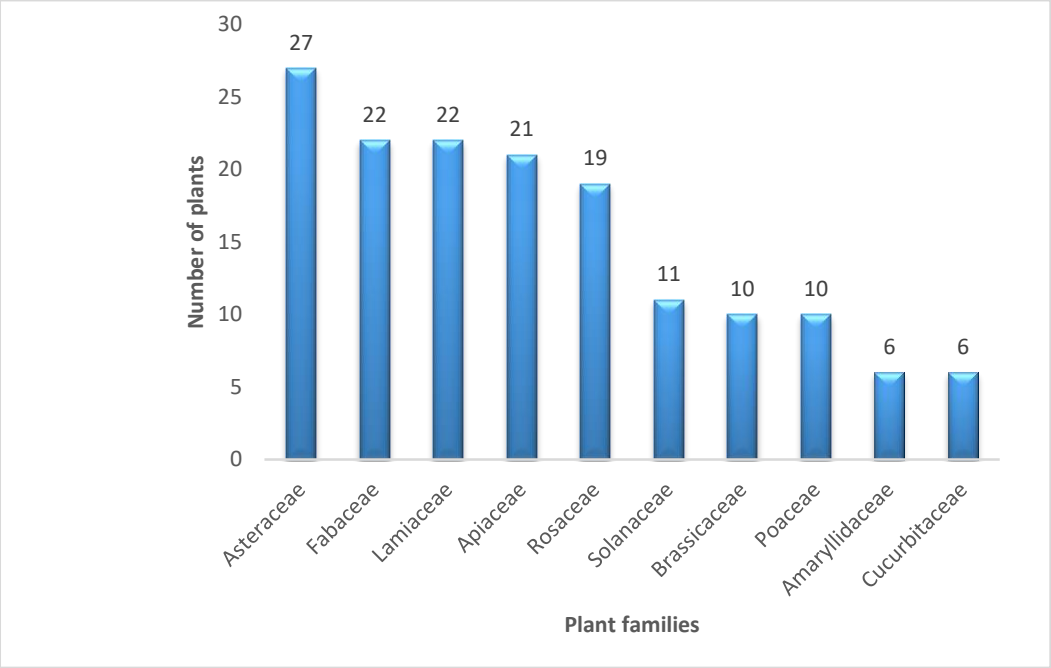


Figure 24 *Statistics of plant families.*

3.2.1 Plant's growth form, parts used, and origin

As mentioned above, we found that our informants cited 270 medicinal plant species that are used in the study area, out of which 70% were herbs, 17% trees, and 13% shrubs. The majority of medicinal plants used in our study area are native (81%), while 19% of these plants are imported species that are commonly imported from India and Pakistan (Figure 25).

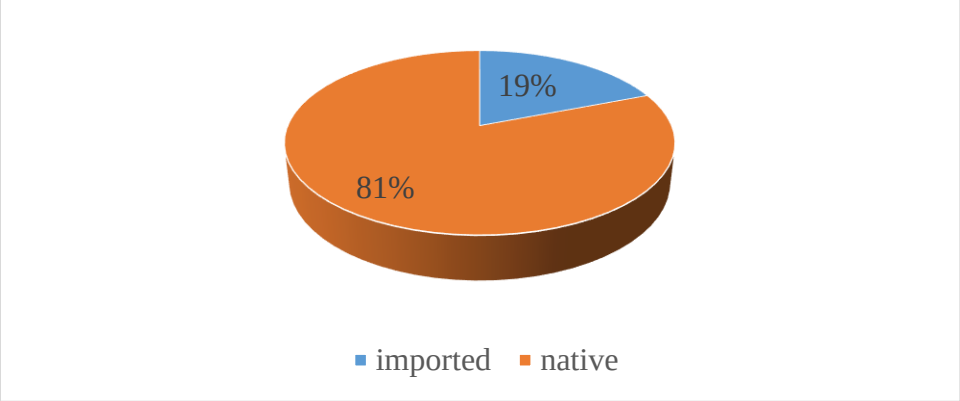


Figure 25 *Statistics of medicinal plants origin used in the study area.*

In most cases, aerial parts (18%) are used for curing ailment followed by fruits (17%), seeds and leaves (15%, each), roots and rhizomes (14%), and flowers (11%), bark (2%), and bulb (1%) are the least used plant parts. Also, organic plant substances (gum, oil, and resin) account for 7% of the total used herbal products (Figure 26).

The results show that the majority of plant parts that are used by people in our study area are overground parts that include flowers, leaves, herbal material, seeds, and fruits. Aboveground parts account for 76% of the total used parts of the medicinal flora of the region, which are useful parts of the plants and if carefully gathered could not have a damaging effect on the plants.

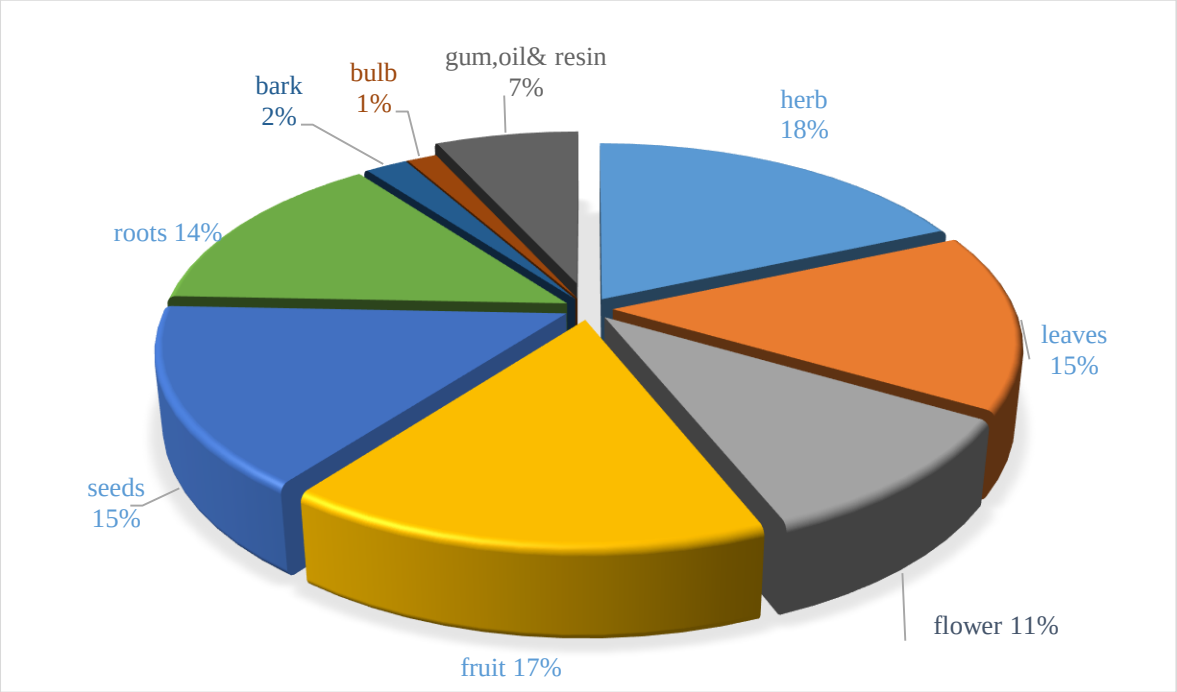


Figure 26 *Statistic of medicinal plant parts used in the study area.*

3.2.2 Preparation and route of administration

For treatment purposes, numerous forms of preparation are used. The most popular medicinal preparations are infusions (21%), followed by powder forms (20%), decoctions (17%), fresh plant materials (11%), macerations, and cooked forms (6% each), and poultices (4%). In a lower proportion medicinal plants were used as raw plants (3%), as juice, paste, smoked, and dry (2% each) as well as rub (1%). Others are used in at least one case (grinding, drop, solution, roosted, beverage, tincture, chewing, and teeth brushing) (Figure 27).

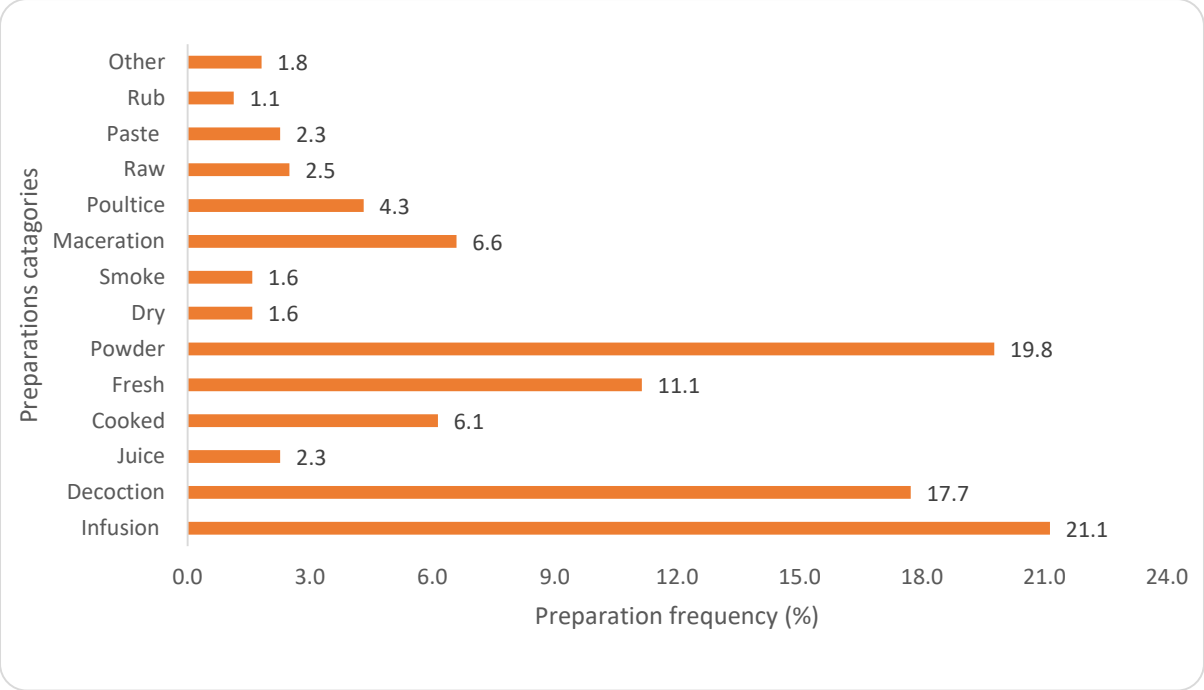


Figure 27 *Preparation forms of medicinal plants in the study area.*

The majority of medicinal plant species (68% of all species) in this study are cited by 1-10 informants while the remaining 32% of the species are cited by 11 and more informants. Even 3% of these species are cited by more than 71 to 155 informants. These species are very respected by the community and are commonly used among people (Figure 28). An increase in the number of informants for the citation of a particular plant species shows the popularity of those particular plants among people because frequently cited plants are more popular.

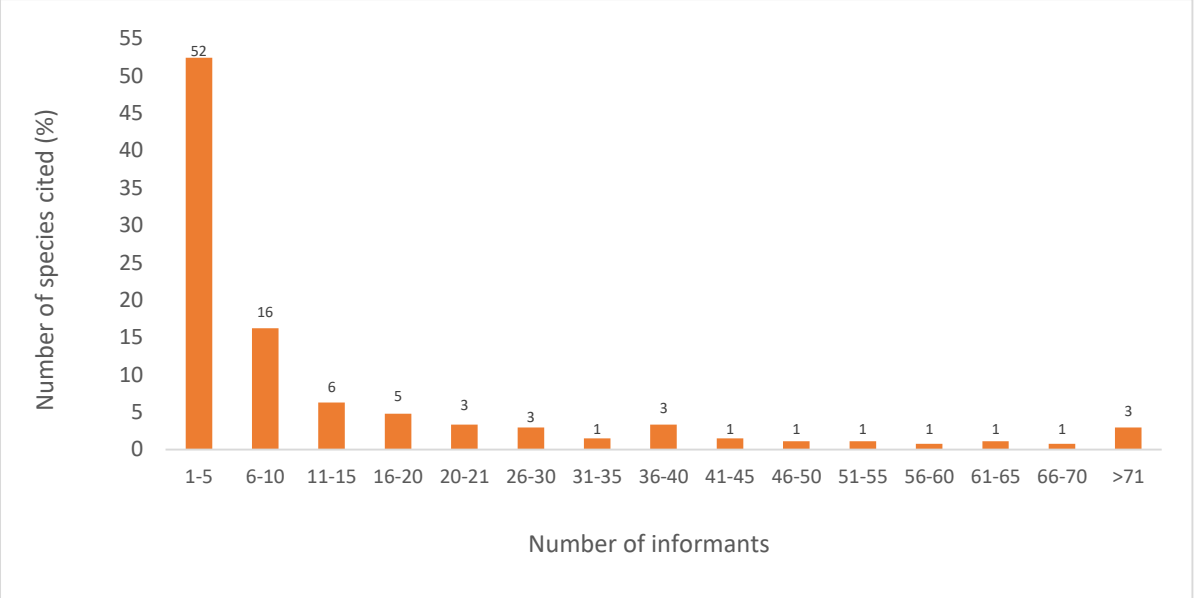


Figure 28 *displays the popularity of medicinal plants among the people in the study area*

The medicinal plants which are cited by more than 10 informants are listed in Table 12 accompanied by their scientific names, parts used, major compounds, or group of compounds, and frequency.

3.2.3 The main uses of medicinal plants in the study area

Most of the medicinal plant species reported by our informants have multiple-use and are used for curing various diseases and only a few species were found to be used for a single purpose. Gastrointestinal disorders, muscle-skeletal disorders, respiratory problems, cardiovascular disorders, nervous disorders, and infectious, dermatological, and gynecological complaints are major affections in the area (Figure 29).

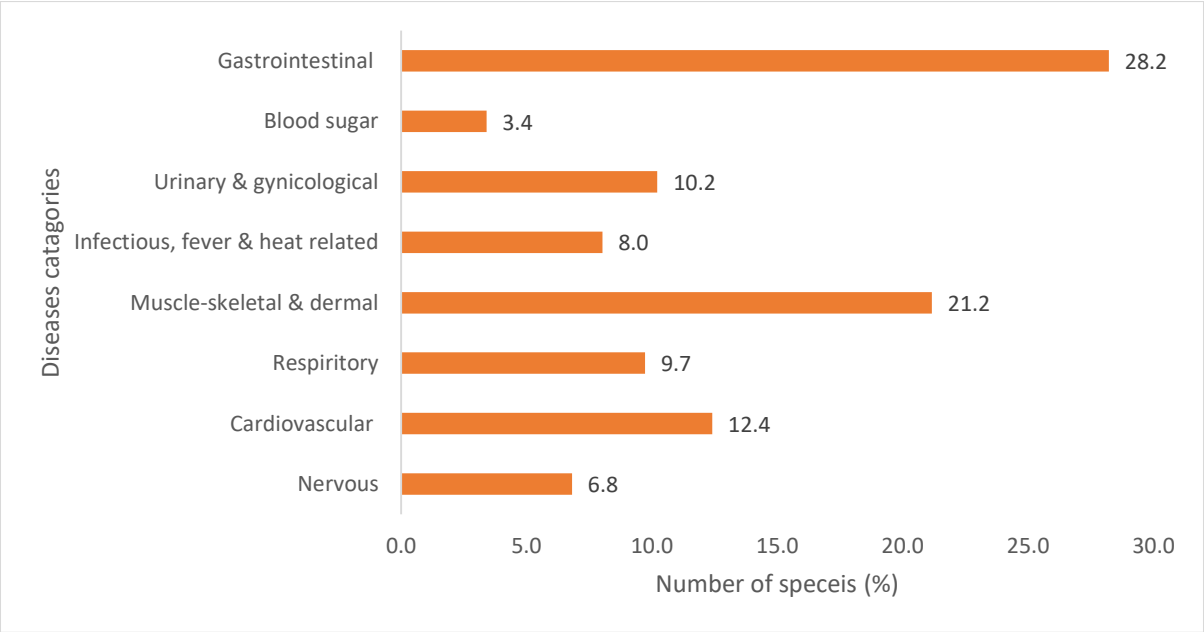


Figure 29 *Application of medicinal plants in the study area*

The results of this study reveal that a total of 116 species are used for the treatment of gastrointestinal disorders, such as stomachache, abdominal pain, diarrhea, dysentery, flatulence, vomiting, gastritis, hyperacidity, peptic ulcer, etc., while 86 species are used to treat muscle-skeletal and dermatological ailments, 51 to treat cardiovascular illness, 42 for urinary and gynecological complaints, 40 for respiratory ailments, 33 for infectious and heat-related diseases, 28 for the illness of the nervous system and 14 for the management of blood sugar, which is tabulated and discussed in the following pages.

3.2.3.1 Medicinal plants are mainly used in the treatment of nervous disorders

Based on the World Health Organization (WHO) estimation, more than one billion people in the world undergo illnesses in the nervous system. Neurologic diseases are disorders of the central and peripheral nervous systems which, include epilepsy, Alzheimer's disease, headaches and migraines, Parkinson′s disease, neuro infections, tumors of the brain, and traumatic disorders of the nervous system. Mental disorders are psychiatric diseases like anxiety, depression, and schizophrenia that affect thought, feeling, or behavior. These illnesses are also cost-effective and cause the loss of working hours, early retirement, and, in many cases, lifelong care. These social, ethical, and economic reasons call for the urgent improvement of medical research in this field (Calvo & Cavero, 2015b).

This investigation reveals that 28 medicinal plants are mainly used by the resident people of our study area for the management of nervous and mental disorders. These medicinal plants belong to 19 families, mainly represented by Lamiaceae, Rosaceae, Papaveraceae, Fabaceae, Rutaceae, and Solanaceae (46.4%). These medicinal plants are given in Table 4, where they are listed based on their family accompanied by their scientific name, family, part used, preparation form, and frequency. Frequency also covers further indications.

The most frequently used parts are leaves (20%), aerial parts (17%), seeds and fruits (14% each), oils (11%), flowers (9%), plant exudate (9%), and roots (6%). Plants are administered in different preparation forms and the most important forms are infusion (31%), powder (21%), fresh eating (13%), decoction and raw eating (8% each), and in lower extents, cooked, smoke, dry, solution, rub, coverage, and rub (25%).

We consulted an official phytotherapy book (PDR, 2007) regarding the medicinal plants, which are mainly used in neurological disorders in our study area, and we found that 22 out of 28 medicinal plant species have monographs in this reference. Some of them have already been pharmacologically validated for neurological diseases. However, among the medicinal plants cited by our informants for the treatment of nervous disorders, *Conium maculatum* and *Aconitum rotundifolium* are considered toxic plants (PDR, 2007).

Headache is pain everywhere in the area of the head or neck. It can be a symptom of various disorders of the head and neck. The most widely cited plants for this affection are Nepeta spp., Camellia sinensis, and Myrtus communis. The first two plants are administered internally as an infusion, as well as powder, strewed on food, but the leaves of M. communis are smoked.

Table 4 *Medicinal plants mainly used in the treatment of nervous disorders*

#	Scientific name	Family	PU	PR	Popular uses (number of use reports)	FQ
1	*Conium maculatum*	Apiaceae	SE	Pw	Analgesic (2).	2
2	*Borago officinalis*	Boraginaceae	FL	In	Analgesic (7), nervous disorders (5), and relaxing (6).	44
3	*Boswellia carteri*	Burseraceae	GU	Pw	Memory enhancement (1).	1
4	*Cannabis sativa*	Cannabinaceae	RE	Sm	Relaxing (4), insomnia (4), analgesic (6), neuralgia (1), migraine (1), Parkinson's disease (1), seizure (1), nervous diseases (1), anti-fatigue (1), antidepressant (1), and sedative (1).	20
5	*Erythroxylum coca*	Erythroxylaceae	LE	So	Local anesthetic (1) and anti-anxiety (1).	1
6	*Glycine max*	Fabaceae	FO	Co	Antidepressant (1).	2
7	*Lens culinaris*	Fabaceae	SE	Co	Relaxing (1) and for memory enhancement (1).	1
8	*Nepeta glutinosa*	Lamiaceae	FL	In	Analgesic (14) and anti-obesity (1).	33
9	*Nepeta juncea*	Lamiaceae	HE	In, Pw	Analgesic (15), for insomnia (2), nervous problems (2), and as a sedative (1).	30
10	*Nepeta podostachys*	Lamiaceae	HE	In, Pw	Sedative (1) and for headaches (1).	3
11	*Ocimum basilicum*	Lamiaceae	HE	Fr, In, Pw	Nervous tonic (6), sedative (5), hypnotic (2), for headaches (3), migraine (3), nervous diseases (3), and vertigo (1), antidepressant (1).	22
12	*Gossypium hirsutum*	Malvaceae	FO	Ru	Anti-anxiety (1) and memory enhancement (1).	3

#	Scientific name	Family	PU	PR	Popular uses (number of use reports)	FQ
13	*Ficus carica*	Moraceae	FU	Fr, Dy	Memory enhancement (3), autoerotism (1), and sexual tonic (1).	16
14	*Myrtus communis*	Myrtaceae	LE	Sm	Sedative (1), nervous disorders (1), and headaches (1).	2
15	*Papaver somniferum*	Papaveraceae	RE, FU	De, Pw	Analgesic (12), hypnotic (7), sedative (4), and to reduce libido (2).	20
16	*Papaver pavonium*	Papaveraceae	HE	In	Analgesic (2), nervous tonic (1), and hypnotic (1).	5
17	*Aconitum rotundifolium*	Ranunculaceae	RO, LE	Pw	Nervous problems (1).	1
18	*Ziziphus jujuba*	Rhamnaceae	FU	Ra	Sedative (4), anti-anxiety (1), and restlessness (1).	11
19	*Amygdalus communis*	Rosaceae	SE, FO	Ra	Nervous tonic (6), aphrodisiac (3), relaxing (3), and nervous disorders (1).	10
20	*Amygdalus communis*	Rosaceae	SE, FO	Ra	Relaxing (1) and against migraine (1).	4
21	C*rataegus songarica*	Rosaceae	LE, FU	In, Fr	Nervous tonic (1).	13
22	*Coffea arabica*	Rubiaceae	SE	In	Relaxing (2), memory enhancement (1), and stimulant (1).	2
23	*Citrus* × *aurantium*	Rutaceae	LE, FL, PE	In, De, Fr	Convalescence (1), insomnia (1), anti-anxiety (1), and nervous problems (1).	1
24	*Citrus* × *aurantium* [var. *amara*]	Rutaceae	FU	In, Fr	Nervous tonic (4).	9
25	*Salix alba*	Salicaceae	LE, RO	Cv	Analgesic (4), headache (5), and migraine (2).	40
26	*Atropa belladonna*	Solanaceae	HE	In, Pw	Nervous disorders (2), epilepsy (1), and vertigo (1).	2
27	*Hyoscyamus niger*	Solanaceae	HE	De	Headache (1), stuttering (1).	3
28	*Camellia sinensis*	Theaceae	LE	In	For headaches (1) and as a CNS stimulant (1).	2

Three plants were reported as hypnotic or sleep aid for insomnia. The dried capsule of *Papaver somniferum* is the most important drug in the form of decoction. Also, it is essential to highlight the importance of *Borago officinalis* and opium as analgesics, and of *Ocimum basilicum*, *Ziziphus jujuba*, and *Amygdalus communis* var. *amara* as relaxing or sedative agents for nervousness.

3.2.3.2 Medicinal plants used mainly for the treatment of cardiovascular disease

Cardiovascular diseases are highly prevalent in human communities and their treatment owns a health priority in all parts of the world. Among cardiovascular diseases, hypertension is a serious disease and the mortality rate in patients with hypertension is high. It considerably contributes to increasing sudden death in cardiac disease patients, intensified by risk factors such as smoking, diabetes, and hypercholesterolemia (Baharvand-Ahmadi & Asadi-Samani, 2017).

According to the literature, the budget of the European Union for cardiovascular disease is currently estimated at €196 billion per year. The researcher's expectancy shows, that the number of people that die from cardiovascular disorders (mainly from heart disease and stroke) will possibly rise to 23.3 million by 2030. Therefore, attention must be paid to avoiding cardiovascular disease. (Calvo & Cavero, 2014a).

Medicinal plants play a significant role in the treatment of mild forms of cardiovascular diseases and we found that 51 out of 270 medicinal plant species reported by our informants are mainly used in the treatment of cardiovascular disorders. These medicinal plants belong to 29 families, mainly represented by Amaryllidaceae, Apiaceae, Asteraceae, Rosaceae (5 species, each), Brassicaceae (4 species), Fabaceae (3 species), and Lamiaceae and Moraceae (2 species each). These medicinal plants are listed in Table 5, where plants are ordered based on their family accompanied by their scientific name, family, part used, preparations form, indications, and frequency. Frequency also covers further indications of these plants.

The most frequently used parts of these plants are leaves (25%), fruits (24%), aerial parts (15%), roots (12%), seeds (10%), bulbs (5%), flowers, bark, fruit peel, oil, and resin (2% each). These medicinal plants are used in different forms of preparations. The percentage of internal uses is 91% and the most important methods of preparation are fresh food (27%), infusion (19%), decoction (15%), powder, maceration (12% each), dry (4%), cooked (6%), raw eating, and pill (4%).

Table 5 *Medicinal plants mainly used in the treatment of cardiovascular diseases*

#	Scientific name	Family	PU	PR	Use (number of use reports)	FQ
1	*Allium cepa*	Amaryllidaceae	BU	Fr	Antihypertensive (1), blood purifier (1), and hypolipidemic (2).	17
2	*Allium circumflexum*	Amaryllidaceae	LE	Co	Antihypertensive (1).	5
3	*Allium mirum*	Amaryllidaceae	BU	Fr	Antihypertensive (1).	1
4	*Allium sativum*	Amaryllidaceae	BU	Fr	Antihypertensive (23), hypolipidemic (4), antiatherosclerotic (2), and heart problems (2).	35
5	*Allium schoenoprasum*	Amaryllidaceae	LE	Co	For the treatment of hemorrhoids (3).	3
6	*Pistacia vera*	Anacardiaceae	FU	Dy	For anemia (1).	1
7	*Anethum graveolens*	Apiaceae	HE, SE	In, Pw	Antihypertensive (34).	63
8	*Apium graveolens*	Apiaceae	HE, SE	In, Pw	Antihypertensive (4).	6
9	*Ferula downieorum*	Apiaceae	RE	Pi	Hemorrhoid (1).	1
10	*Ferula ovina*	Apiaceae	RO	Mc	Antihypertensive (1).	1
11	*Levisticum officinale*	Apiaceae	HE, RO	Pw, De	Antihypertensive (25), hypolipidemic (5), for hemorrhoid (2).	42
12	*Nerium oleander*	Apocynaceae	LE	De	Heart disorders (1), cardiotonic (1), and diuretic (1).	1
13	*Areca catechu*	Araceae	SE	Pw	Blood purifier (1).	1
14	*Cousinia buphthalmoides*	Asteraceae	RO	De, Pw	Hypolipidemic (1).	5
15	*Eclipta alba*	Asteraceae	LE, SE	In	Blood purifier (1).	1
16	*Lactuca sativa*	Asteraceae	LE	Fr	Hypolipidemic (1), antihypertensive (2), and blood purifier (1).	4
17	*Senecio glaucus*	Asteraceae	HE	De	Antihypertensive (1).	1
18	*Taraxacum officinale*	Asteraceae	HE, RO	In, Mc	Hypocholesterolemic (1) and antihypertensive (1).	7
19	*Berberis integerrima*	Berberidaceae	LE, FU	Mc	Antihypertensive (9), hypolipidemic (13), and anti-obesity (1).	90
20	*Brassica oleracea*	Brassicaceae	LE	Fr	Anti-obesity (1) and hypolipidemic (1).	3

#	Scientific name	Family	PU	PR	Use (number of use reports)	FQ
21	*Lepidium sativum*	Brassicaceae:	LE, SE	Fr Pw	Antihypertensive (1).	3
22	*Nasturium officinale*	Brassicaceae:	HE	Fr	Hypolipidemic (1).	1
23	*Raphanus raphanistrum* subsp. *sativus*	Brassicaceae	RO	Fr	Hypolipidemic (1), anti-obesity (1), and diuretic (1).	2
24	*Convolvulus arvensis*	Convolvulaceae	HE	In	Antihypertensive (6) and hypolipidemic (2).	12
25	*Elaeagnus angustifolia*	Elaeagnaceae	LE	In	Hypolipidemic (5), antihypertensive (3), blood purifier (1), anti-obesity (2).	36
26	*Ephedra gerardiana*	Ephedraceae	HE	De	Antihypertensive (14).	49
27	*Arachis hypogaea*	Fabaceae	SE	Ra	Hypolipidemic (1).	1
28	*Cercis siliquastrum*	Fabaceae	LE	In	Antihypertensive (1).	2
29	*Senna alexandrina*	Fabaceae	LE	De	Against abdominal lipid (1).	2
30	*Ribes orientale*	Grossulariaceae	FU	De	Antihypertensive (1).	1
31	*Nepeta pubescens*	Lamiaceae	RO	Mc	For nasal bleeding (1).	1
32	*Ziziphora clinopodioides*	Lamiaceae	HE	In	Antihypertensive (5) and hypolipidemic (4).	21
33	*Cinnamomum zylanium*	Lauraceae	BA	De, Pw	Heart disorders (4), hypolipidemic (6), and heart failure (1).	21
34	*Hibiscus sabdariffa*	Malvaceae	CA	De	Antihypertensive.	1
35	*Morus alba*	Moraceae	FU	Fr, Dy	Antihypertensive.	2
36	*Morus nigra*	Moraceae	FU	Fr, Pw	Antihypertensive, hypolipidemic (2), blood purifier (2), and anemia (2).	8
37	*Olea europaea*	Oleaceae	LE, FO	In, Co	Antihypertensive (9) and hypolipidemic (2).	14
38	*Sesamum indicum*	Pedaliaceae	FO	Co	Heart disorders (1), antihypertensive (2), antiatherosclerotic (2), and anti-obesity (1).	3
39	*Phragmites australis*	Poaceae	RO	Mc	Antihypertensive (1).	1

#	Scientific name	Family	PU	PR	Use (number of use reports)	FQ
40	*Rheum ribes*	Polygonaceae	PE	Fr	Hypolipidemic (4), antihypertensive (4), and anemia (2).	22
41	*Ziziphus jujuba*	Rhamnaceae	FU	Dy	Antiatherosclerotic (1), antihypertensive (2), hypolipidemic (3), cardiotonic (1), and blood purifier (2).	11
42	*Crataegus songarica*	Rosaceae	LE, FU	In, Fr	Heart disorders (4), antihypertensive (3), and hypolipidemic (4).	13
43	*Malus domestica*	Rosaceae	FU	Fr, In	Cardiotonic (4), anti-obesity (2), blood purifier (2), and antiatherosclerotic (3).	12
44	*Prunus cerasus*	Rosaceae	FU	Fr	Hypolipidemic (4), blood purifier (4), and anemia (1).	58
45	*Rosa canina*	Rosaceae	FU	Mc, Ra	Hypolipidemic (2), antihypertensive (1), and anemia (1).	9
46	*Rubus caeslus*	Rosaceae	FU	Fr	Hypolipidemic (1).	4
47	*Citrus x aurantium* [var. *amara*]	Rutaceae	FU	Fr	Hypocholesterolemic (2) and antihypertensive (1).	9
48	*Digitalis purpurea*	Scrophulariaceae	FL	In	For heart diseases (1), antihypertensive (1), diuretic, and cardiotonic (1).	1
49	*Withania coagulans*	Solanaceae	FU	De, Mc	Hypolipidemic (2) and antihypertensive (1).	5
50	*Camellia sinensis*	Theaceae	LE	In	Antihypertensive (3), hypolipidemic (1), antiatherosclerotic (1), blood purifier (1), and heart diseases (1).	12
51	*Vitis vinifera*	Vitaceae	FU, TE	Fr, Mc	Cardiovascular disorders (3) and anemia (1).	19

People use medicinal plants in different affection of the cardiovascular system and medicinal plants are mainly used for the treatment of hypertension, hemorrhoids, atherosclerosis, anemia, and hyperlipidemia as well as blood purifiers. Moreover, most of the informants used the general term cardiovascular disorders for indication of these plants without any explanation.

The most often cited plants for the treatment of cardiovascular disorders are *Anethum graveolens*, *Levisticum officinale*, *Allium sativum*, *Ephedra* spp., *Olea europaea*, *Berberis integerrima*, *Convolvulus arvensis*, *Ziziphora clinopodioides* subsp. *afghanica*, and *Apium graveolens*. *Pistacia vera* is the only plant cited for anemia in general.

3.2.3.3 Medicinal plants are mainly used for the treatment of the respiratory system

Respiratory diseases are very frequent ailments of the population, especially in developing countries such as Afghanistan, where individual and environmental conditions dispose to a high occurrence of infection of respiratory tracts and bacterial complications of a common cold. The main causes of respiratory diseases are acute infections and asthma in children, as well as tuberculosis and chronic lung diseases in adults (Caceresc, et al., 1991).

Factors associated with infections are various and include microbial virulence, insufficient nutrition, contaminated environments, and crowded homes. In Afghanistan, these problems are expanded by the extensive use of wood, shrubs, and coal for heating homes in winter rising the risks of respiratory diseases because of sustainable exposure in homes which are polluted by combustion products. Literature reveals that respiratory infections are the second cause of infant mortality in Afghanistan. Upper respiratory infections, such as rhinitis, pharyngitis, laryngitis, and bronchopneumonia, account for 35.8% of the infectious diseases of childhood (Mata, 1978). Thus, using medicinal plants is the first, and sometimes the only, option for the rural population in Afghanistan.

In this study, we found that 40 out of 270 medicinal plants reported by our informants are mainly used in the treatment of respiratory disorders which are listed in Table 6. Plants are listed based on their family accompanied by the scientific name, family, part used, preparation, uses, and frequency. Frequency also covers further indications of the plants.

These medicinal plants belong to 25 families, mainly represented by Asteraceae, and Rosaceae (4 species each), Papaveraceae, Lamiaceae (3 species each), Brassicaceae, Fabaceae, Malvaceae, Plantaginaceae, and Solanaceae (2 species each).

Table 6 *Medicinal plants are mainly used in the treatment of respiratory illness.*

#	Scientific name	Local name	PU	PR	Use (number of use reports)	FQ
1	*Amaranthus retroflexus*	Amaranthaceae	IF	Ju	Antitussive (1), sore throat (2).	5
2	*Pimpinella* sp.	Apiaceae	HE	In, Pw	Common cold (5).	7
3	*Cocos nucifera*	Arecaceae	FU	Fr, Ju	Antituberculotic (1).	2
4	*Pyrethrum roseum*	Asteraceae	FL	In	For pneumonia (1) and antitussive (1).	2
5	*Helianthus annuus*	Asteraceae	SE	Ra	Common cold (2) and antitussive (2).	4
6	*Inula helenium*	Asteraceae	RO	De, Mc	Grippe (1) and expectorant (1).	1
7	*Tussilago farfara*	Asteraceae	LE	In	Antitussive (1).	1
8	*Brassica rapa*	Brassicaceae	RO	Ju, Co	Bronchitis (2), antitussive (6), common cold (14), and pneumonia (4).	25
9	*Raphanus raphanistrum* var. *longipinnatus*	Brassicaceae	RO	Fr, Ju	Bronchitis (1).	2
10	*Codonopsis clematidea*	Campanulaceae	LE	In	Antitussive (1).	1
11	*Ipomoea tricolor*	Convolvulaceae	FL	In	Antitussive (3).	3
12	*Ephedra gerardiana*	Ephedraceae	HE	De	For bronchitis (5), pneumonia (5), and as an antitussive (2).	49
13	*Vaccinium macrocarpon*	Ericaceae	FU	In	For bronchitis (1).	1
14	*Glycyrrhiza glabra*	Fabaceae	RO	De, Mc	Antitussive (18), for bronchitis (10), pneumonia (6), and as an expectorant (2).	83
15	*Sophora alopecuroides* var. *tomentosa*	Fabaceae	LE, RO	De, Pw	Antitussive (2) and bronchitis (2).	10

#	Scientific name	Local name	PU	PR	Use (number of use reports)	FQ
16	*Salvia macrosiphon*	Lamiaceae	HE, SE	De, Pw	Antitussive (3) and bronchitis (2)	9
17	*Salvia officinalis*	Lamiaceae	HE	In	For respiratory tract infections (1).	1
18	*Salvia rhytidea*	Lamiaceae	HE	De	For pneumonia (6), bronchitis (3), and antitussive (3).	25
19	*Linum usitatissimum*	Linaceae	SE	Mc	Antitussive (3), constipation (2), and pneumonia.	5
20	*Althaea officinalis*	Malvaceae	FL	In	For respiratory disorders (5), bronchitis (14), pneumonia (21), sore throat (12), common cold (18), and as an antitussive (34).	95
21	*Malva neglecta*	Malvaceae	HE, RO	In, Ju	For bronchitis (4), sore throat (17), common cold (2), and as an antitussive (14).	47
22	*Ficus carica*	Moraceae	FU	Fr, Dy	For bronchitis (1), common cold (1), pertussis (3), pneumonia (3), and as an antitussive (4).	16
23	*Eucalyptus globulus*	Myrtaceae	LE	De	For bronchitis (1), respiratory disorders (1), and as an expectorant (1).	2
24	*Papaver dubium*	Papaveraceae	FU	De	For bronchitis (3), sore throat (1), pertussis (1), and common cold (2).	5
25	*Papaver somniferum*	Papaveraceae	FU	De	Antitussive for dry cough (7), bronchitis (2), and pneumonia (1).	20
26	*Papver pavonium*	Papaveraceae	HE	In	For bronchitis (3), common cold (2), and as an antitussive (1).	10
27	*Plantago lanceolata*	Plantaginaceae	LE	In	For sore throat (15), pharyngitis (1), common cold (1), influenza (2), and antitussive (1).	31

#	Scientific name	Local name	PU	PR	Use (number of use reports)	FQ
28	*Plantago major*	Plantaginaceae	SE	Co	For pneumonia (18), bronchitis (9), sore throat (8), expectorant (4), and antitussive (13).	94
29	*Polygonum aviculare*	Polygonaceae	HE	In	For sore throat (1) and pneumonia (1).	5
30	*Primula pamirica*	Primulaceae	HE	In	For respiratory tract inflammation (2), sore throat (1), and bronchitis (2).	3
31	*Adiantum capillus veneris*	Pteridaceae	HE	In	Antitussive (1), expectorant (2).	2
32	*Ranunculus olgae*	Ranunculaceae	FL, HE	In, Pw	Antitussive (1) and for bronchitis.	9
33	*Amygdalus commonis*	Rosaceae	SE	Ra	For the treatment of the common cold (1).	4
34	*Cydonia oblonga*	Rosaceae	FU	De	Antitussive (5), bronchitis (9), pneumonia (6), and anticatarrhal (1).	16
35	*Pyrus communis*	Rosaceae	FU	Ju	Respiratory disorders (1).	2
36	*Rosa foetida*	Rosaceae	GU	Ch	Antitussive (1) and for bronchitis (1).	2
37	*Coffea arabica*	Rubiaceae	SE	In	Respiratory stimulant (1).	2
38	*Populus alba*	Salicaceae	BA, LE	De	Antitussive (1), for hoarseness (1), pneumonia (1), and bronchitis (1).	4
39	*Datura stramonium*	Solanaceae	LE	Sm	For bronchitis (2), respiratory tract infections, and common cold (1), and as an antitussive (1).	10
40	*Solanum tuberosum*	Solanaceae	FL	In	Common cold (2).	8

The most frequently used parts of these plants are their aerial parts (24%), fruits, leaves (16% each), roots flowers, and seeds (13%, each), and others including gum, and bark (5%).
The most important forms of used preparation are infusion (31%), decoction (25%), juice (11%), powder, fresh (7% each), maceration (5%), raw and cooked eating (4% each); in lower proportions, dry, smoke and chewing (2% each).

3.2.3.4 Medicinal plants are mainly used in the treatment of gastrointestinal disorders

The human digestive system is a complex system of glands and hollow organs that process food. For the utilization of food, the body must break it down into smaller molecules to build and nourish cells and provide energy, and the body must also excrete the waste by-products. The inner layer of these hollow organs is called the mucosa. In the mouth, stomach, and small intestine, the mucosa contains tiny glands that produce enzymes that help to digest food. Two solid organs (liver and pancreas) produce or store digestive chemical liquids that reach the small intestine (NIH, 2019). Common gastrointestinal disorders are stomach/abdominal pain, diarrhea, dysentery, gastroenteritis, constipation, vomiting, etc.

In this study, we found that people use medicinal plants for the treatment of various gastrointestinal disorders ranging from simple affection such as stomachache and vomiting to more complex problems like a peptic ulcer. Digestive problems which are indicated by our informants include carminative, tonic, appetizer, stomach/abdominal pain, digestive, and intestinal problems, diarrhea, dysentery, liver and gallbladder problems, indigestion, and mouth affections.

Our informants reported that 116 out of 270 medicinal plants are mainly used in the treatment of gastrointestinal disorders which are listed in Table 7. Plants are ordered based on their family accompanied by the scientific name, family, part used, preparation, uses, and frequency. Frequency also covers further indications.

The majority of these medicinal plants are native and only few of them are imported from other countries. These medicinal plants belong to 43 families, mainly represented by Asteraceae (15 species), Apiaceae (14 species) Fabaceae, Lamiaceae (10 species each), Rosaceae (7 species), Plantaginaceae, Poaceae, Polygonaceae, and Zingiberaceae (4 species each), Euphorbiaceae, and Solanaceae (3 species each),

Table 7 *Medicinal plants used in gastrointestinal disorders.*

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
1	*Sambucus racemosa*	Adoxaceae	FU	De	Stomach infectious (1).	1
2	*Allium circomflexum*	Amaryllidaceae	LE	Co	Constipation (3).	5
3	*Allium schoenoprasum*	Amaryllidaceae	LE	Co	Antiemetic (1).	3
4	*Pistacia atlantica*	Anacardiaceae	RE, LE	De, Pw	Antidiarrhoeal (2).	1
5	*Anethum graveolens*	Apiaceae	HE, SE	In, Pw	For flatulence (6), stomachache (5), and as digestive (2).	63
6	*Apium graveolens*	Apiaceae	HE, SE	In, Pw	For flatulence (1) and constipation (1).	6
7	*Carum carvi*	Apiaceae	SE	De, Pw	For flatulence (2), constipation (1), gastric ulcer (1), antidiarrhoeal (1), digestive (2), appetizer (2), and antiemetic (1).	20
8	*Trachyspermum copticum*	Apiaceae	SE	Dec, Pw	For stomachache (20), flatulence (20), constipation (3), gastritis (3), hyperacidity (1), peptic ulcer (2), and digestive (2).	58
9	*Coriandrum sativum*	Apiaceae	HE, SE	Fr, Pw	For stomachache (5), constipation (1), flatulence (4), digestive (9), appetizer (3), antispasmodic (3), and stomachic (1).	26
10	*Cuminum cyminum*	Apiaceae	SE	In, Pw	For flatulence (15), digestive diseases (7), constipation (5), stomachache (6), and antidyspeptic (2).	26
11	*Ferula narthex*	Apiaceae	RO	Mc	Appetizer for livestock (3).	3

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
12	*Ferula assa-foetida*	Apiaceae	RE	Pi	For stomachache (2), anthelmintic (4), and antispasmodic (1).	9
13	*Ferula diversivittata*	Apiaceae	RE	Pi	Stomachache (2) and anthelmintic (1).	5
14	*Foeniculum vulgare*	Apiaceae	HE, SE	In, Pw	Antispasmodic (3), stomachache (43), flatulence (32), constipation (7), digestive disorders (7), antidiarrhoeal (3), and appetizer (2).	99
15	*Heracleum lehmannianum*	Apiaceae	LE, RO	De, In	Antiemetic (2), antidiarrhoeal, for flatulence (1), stomachache (1), sore throat (2), hepatitis (1), anti-icteric (1).	19
16	*Levisticum officinale*	Apiaceae	HE, RO	Pw, De	For digestive disorders (10), stomachache (7), and antispasmodic (1).	42
17	*Prangos pabularia*	Apiaceae	RO, SE	De	For flatulence (2), stomachache (1), and toothache (3).	7
18	*Ferula* sp.	Apiaceae	RO	Pw	For stomachache (10), flatulence (7), antidiarrhoeal, and antispasmodic (1).	27
19	*Acorus calamus*	Araceae	RO	De, Pw	Against constipation (1), peptic and duodenum ulcers (1), and stomach disorders (7).	7
20	*Mangifera indica*	Arecaceae	SE	Pw	Antidiarrhoeal (9), and antidysenteric (2).	13
21	*Eremurus stenophyllus*	Asphodelaceace	LE	Co	For stomachache (3), flatulence (1), constipation (2), and as anthelmintic (1).	6
22	*Eremurus persicus*	Asphodelaceace	LE	In, Pa	For feet pain (1) and stomatitis (1).	2

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
23	*Achillea millefolium*	Asteraceae	FL, HE	In, Pw	Antidiarrhoeal (2), flatulence (1), antiemetic (1), abdominal pain (2).	3
24	*Achillea wilhelmsii*	Asteraceae	FL, HE	In, Pw	For stomachache (50), antidiarrhoeal (31), antidysenteric (4), anthelmintic (2), and antiemetic (2).	112
25	*Artemisia absinthium*	Asteraceae	HE, FL	In, Pw	For stomachache (9), flatulence (7), appetizer (2), and anthelmintic (8).	70
26	*Artemisia alba*	Asteraceae	HE, FL	In, Pw, Co	Anthelmintic (14), for stomachache (19), flatulence (8), antiemetic (2), and digestive (4).	63
27	*Artemisia dubia*	Asteraceae	HE, FL	In, Pw	For gastroenteritis (1), stomachache (1), flatulence (2), antidiarrhoeal (1), and digestive disorders (1).	3
28	*Artemisia sieberi*	Asteraceae	HE, FL	In, Pw	For constipation (4), stomachache (13), flatulence (9), antiemetic (1), antidiarrhoeal (3), digestive (6), and antidysenteric (1).	52
29	*Centaurea pulchella*	Asteraceae	HE	In	Anthelmintic (3), antiemetic (1), stomachache (1), flatulence (1), and hepatitis (1).	26
30	*Centaurea behen*	Asteraceae	RO	De	Against constipation (1).	1
31	*Matricaria chamomilla*	Asteraceae	HE, FL	In	For stomach disorders (13), peptic ulcer (5), stomachache (5), flatulence (5), gastritis (3), antidiarrhoeal (2), antiemetic (2), digestive (2), antidyspeptic (2), and hyperacidity (1).	38

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
32	*Cichorium intybus*	Asteraceae	RO	Mc	Against hepatitis (30), stomach disorders (15), liver disorders (10), anti-icteric (24), and appetizer (17).	155
33	*Cirsium vulgare*	Asteraceae	RO	Mc	Against hepatitis (1) and anti-icteric (1).	2
34	*Cousinia buphthalmoides*	Asteraceae	RO	De, Pw	Against stomachache (1) and flatulence (1).	5
35	*Helianthus annuus*	Asteraceae	SE	Ra	Antidysenteric (1).	4
36	*Pyrethrum roseum*	Asteraceae	HE, FL	In	Against gastric ulcer (1).	2
37	*Taraxacum officinale*	Asteraceae	HE, RO	In, Mc	Against liver disorders (2) and constipation (1).	7
38	*Berberis integerrima*	Berberidaceae	FU, RO	Mc	Appetizer (9), choleric (3), for a peptic ulcer (3), and constipation (2).	90
39	*Brassica juncea*	Brassicaceae	SE	Pw, Gr	Against liver (1) and spleen pain (1), stomachache (1), appetizer (1), and anti-icteric (1).	5
40	*Descurainia sophia*	Brassicaceae	SE	Co, Mc	Antidiarrhoeal (21), against constipation (21), stomachache (18), flatulence (3), antiemetic (5), appetizer (4), stomachic (2), and anti-icteric (4).	86
41	*Opuntia dillenii*	Cactaceae	FU	Fr	Against constipation.	1
42	*Capparis spinosa*	Capparaceae	FU	Co	Against stomachache (3), liver disorders (2), and antidiarrhoeal (1).	8
43	*Carica papaya*	Caricaceae	FU	Fr	Antidyspeptic (1).	1
44	*Chenopodium alba*	Chenopodiaceae	HE	In	Against stomachache (1), constipation (1), and anti-icteric (1).	2

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
45	*Terminalia chebula*	Combretaceae	FU	Ja, Mc, Pa	Against constipation (5), abdominal pain (1), gastrointestinal disorders (5), gluttony (1), and flatulence (1).	13
46	*Ipomoea tricolor*	Convolvulaceae	LE, FL	In	Emollient (3).	3
47	*Citrullus colocynthis*	Cucurbitaceae	FU	De, Pw	Anthelmintic (1), for treatment of constipation (6).	16
48	*Elaeagnus angustifolia*	Elaeagnaceae	LE, FU	In, Ra	For treatment of digestive disorders (11), antidysenteric (1), antidiarrhoeal (12), antiemetic (1), and flatulence (1).	36
49	*Ephedra gerardiana*	Ephedraceae	HE	De	Stomatitis (3), stomachache (3), antispasmodic (1), and digestive disorders (15).	49
50	*Euphorbia granulata*	Euphorbiaceae	HE	In, Pw	Anthelmintic for pinworms (1), antidiarrhoeal (1).	1
51	*Euphorbia megalocarpa*	Euphorbiaceae	SA	Pa	For treatment of constipation (4), anthelmintic (1), severe stomachache (1), and stomach cancer (1).	7
52	*Ricinus communis*	Euphorbiaceae	FO	Ra	Constipation (3).	4
53	*Alhagi pseudalhagi*	Fabaceae	HE, RO	De, Mc	Antidiarrhoeal (17), digestive (5), stomachache (4), constipation, appetizer (5), anti-icteric (2), and flatulence (3).	61
54	*Astragalus gummifera*	Fabaceae	GU	Pw	For treatment of constipation (1) and stomachic (1).	1
55	*Cassia fistula*	Fabaceae	FU	Mc	Stomachache (4), constipation (8), flatulence (2), anti-icteric (1), and aphthous stomatitis (2).	13
56	*Cassia senna*	Fabaceae	LE	In, Pw	Constipation (1) and gastrointestinal disorders (1).	2

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
57	*Cercis siliquastrum*	Fabaceae	LE	In	Antidysenteric (1).	2
58	*Glycyrrhiza glabra*	Fabaceae	RO	De, Mc	For gastrointestinal disorders (50), stomachache (25), peptic ulcer (16), hyperacidity (5), gastritis (3), and anti-icteric (3).	83
59	*Medicago sativa*	Fabaceae	HE	In, Co	Against stomachache (4), peptic ulcer (1), and gastritis (1).	8
60	*Sophora alopecuroides* var. *tomentosa*	Fabaceae	LE, RO	De, Pw	For gastric ulcer (2) and stomach problems (4).	10
61	*Trifolium resupinatum*	Fabaceae	HE, SE	Co, Fr,	For constipation (4) and hepatitis (1).	10
62	*Vicia sativa*	Fabaceae	SE	Co	Against peptic ulcer (1) and hyperacidity (1).	1
63	*Quercus infectoria*	Fagaceae	FU	De, Pw	For anorexia (1) and antidyspeptic (1).	1
64	*Corydalis gortschakovii*	Fumariaceae	HE	In, Pw	Against peptic ulcer (2) and stomachache (1).	4
65	*Fumaria officinalis*	Fumariaceae	HE	In	For digestive disorders (10), appetizers (4), liver disorders (2), hepatitis (4), and anti-icteric (3).	37
66	*Iris germanica*	Iridaceae	RO	De	Antiemetic (1), flatulence (1), and stomachache (1).	5
67	*Mentha longifolia*	Lamiaceae	HE	In, Pw	For treatment of stomachache (17), flatulence (8), digestive disorders (15), antidiarrhoeal (8), antiemetic (4), and appetizer (3).	68
68	*Mentha piperita*	Lamiaceae	HE	Fr, In, Pw	For treatment of stomachache (8), flatulence (15), digestive (4), stomachic (5), antispasmodic (4), appetizer (2), and antiemetic (4).	40

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
69	*Nepeta bracteata*	Lamiaceae	HE	In, Pw	Digestive (1), carminative (1), antidiarrhoeal (1), headache (1), and foot pain (1).	8
70	*Hymenocrater sessilifolius*	Lamiaceae	HE	In, Pw	Stomachache (14) and digestive (2).	43
71	*Ocimum basilicum*	Lamiaceae	HE	Fr, In, Pw	For gastrointestinal diseases (13), antidiarrhoeal (1), and antispasmodic (4).	22
72	*Rosmarinus officinalis*	Lamiaceae	LE	De	Antidiarrhoeal (1), antispasmodic (1), and digestive disorders (1).	2
73	*Salvia haematodes*	Lamiaceae	HE, RO	De, Pw	For foot pain (1), stomachic (2), and anti-icteric (1).	5
74	*Salvia rhytidea*	Lamiaceae	HE	De	For stomachache (8), peptic & duodenal ulcers (1), and digestive (3).	25
75	*Ziziphora clinopodioides*	Lamiaceae	HE	In	For stomachache (3), flatulence (3), abdominal pain (3), peptic ulcer (1), gastritis (1), foot pain (2), and appetizer (3).	21
76	*Ziziphora tenuior*	Lamiaceae	HE	In, Pw	For stomach disorders (1), flatulence (1), and appetizer (1).	8
77	*Linum usitatissimum*	Linaceae	SE	Mc	Laxative (4).	5
78	*Myristica fragrans*	Myristicaceae	FU	Dy	For flatulence in pregnant women and children (2).	2
79	*Syzygium aromaticum*	Myrtaceae	FL	De	Against stomatitis (1), stomachache (3), hyperacidity (2), flatulence (1), antidyspeptic (1), abdominal cramps (1), digestive (1), and appetizer (1).	16
80	*Papaver dubium*	Papaveraceae	FU	De	Stomachache (2) and peptic ulcer (1).	5

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
81	*Papaver pavonium*	Papaveraceae	HE	In	For stomachache (1), constipation (2), and anthelmintic (1).	5
82	*Piper nigrum*	Piperaceae	FU	Pw	Appetizer (3), for digestive disorders (1), flatulence (3), antispasmodic (1), antitussive (1), and stomatitis (1).	6
83	*Plantago lanceolata*	Plantaginaceae	LE	In	Antidiarrhoeal (4), for digestive disorders (4), stomachache (2), and flatulence (1).	31
84	*Plantago major*	Plantaginaceae	SE	Co, Mc	Against constipation (19), stomachache (20), and antidiarrhoeal (4).	94
85	*Plantago ovate*	Plantaginaceae	HU	Mc	Against constipation (1), stomachache (2), antidiarrhoeal (1), and antiemetic (1).	2
86	*Plantago psyllium*	Plantaginaceae	SE	Mc	For stomachache (10), peptic ulcer (4), digestive disorders (10), and antidiarrhoeal (2).	36
87	*Pleurotus eryngii*	Pleurotaceae	TA	Co, Pw	Antidiarrhoeal (5), anthelmintic (7), constipation (3), stomachache (2), and flatulence (1).	17
88	*Avena sativa*	Poaceae	SE	De, Mc	Antigoiterogenic (1) and gallstone (1).	6
89	*Oryza sativa*	Poaceae	SE	Cok	Stomachic (1).	1
90	*Saccharum officinarum*	Poaceae	SM	Ju	For treatment of hepatitis (1).	3
91	*Triticum aestivum*	Poaceae	SE	Fr, Po	For treatment of stomatitis (1).	3
92	*Polygonum aviculare*	Polygonaceae	HE	In, Po	Antidysenteric (2).	5
93	*Koenigia coriaria* (*Polygonum bucharicum*)	Polygonaceae	RO	De, Po	Antidiarrhoeal (3), antiemetic (1), digestive (1), peptic ulcer (2), gingivitis (1), and stomatitis (3).	12

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
94	*Rheum ribes*	Polygonaceae	SM	Fr, Pw	For constipation (2), antidysenteric (1), antiemetic (1), and abdominal pain (1).	22
95	*Rumex crispus*	Polygonaceae	LE, RO	De, Mc	Laxative (6), emollient (1), and stomachic (2).	25
96	*Punica granatum*	Punicaceae	PE	Pw	Anthelmintic (7), antidiarrhoeal (26), liver tonic (1), appetizer (1), stomachache (2), and peptic ulcer (1).	39
97	*Nigella sativa*	Ranunculaceae	SE	De, Pw	For flatulence (4), stomachache (6), laxative (2), and GI infectious (1).	27
98	*Ranunculus olgae*	Ranunculaceae	FL, HE	In	Anthelmintic (2), stomachache (2), and constipation (2).	9
99	*Crataegus songarica*	Rosaceae	FU	Fr	For stomachache (3), hyperacidity (1), antidiarrhoeal (1), and antiemetic (1).	13
100	*Flependula vestita*	Rosaceae	LE	In	Antiemetic (1).	1
101	*Prunus microcarpa*	Rosaceae	FU, SE	Fr, Pw	For constipation (1), stomachache (3), and hepatitis (1).	7
102	*Pyrus communis*	Rosaceae	FU	Ju.	For digestive disorders (1).	2
103	*Rosa beggeriana*	Rosaceae	FU, GU	De, Ra	Antispasmodic (1), for constipation (1), *H. Pylori* (1).	7
104	*Rosa damascena*	Rosaceae	FL	In	For stomachache (7), stomach disorders (11), constipation (4), flatulence (3), and antidiarrhoeal (2).	30
105	*Rubus caeslus*	Rosaceae	FU	Fr	Antidiarrhoeal (1).	4
106	*Cinchona pubescens*	Rubiaceae	BA	Mc	Antidiarrhoeal (1) and appetizer (1).	1
107	*Citrus aurantium* var. *amara*	Rutaceae	FU	Fr	For treatment of digestive disorders (5), appetizer (1).	9

#	Scientific names	Local names	PU	PR	Use (number of use reports)	FQ
108	*Verbascum thapsus*	Scrophulariaceae	LE, FL	In, Po	Antidiarrhoeal (3), flatulence (2), abdominal pain (1), and anti-icteric (2).	21
109	*Capsicum annum*	Solanaceae	FU	Fr, Pw	Appetizer (2).	4
110	*Hyoscyamus niger*	Solanaceae	HE	De	For abdominal pain (1), toothache (1), and dry mouth (1).	
111	*Solanum nigrum*	Solanaceae	FU, LE	De, In	For stomachache (3), constipation (1), antidiarrhoeal (1), and gastritis (1).	11
112	*Curcuma longa*	Zingiberaceae	RH	Pw, Pa	Stomachic (1), appetizer (2), digestive disorders (6), flatulence (6), and liver disorders (1).	27
113	*Curcuma zedoaria*	Zingiberaceae	RH	Pw, Pa	For stomachache (3), flatulence (1), constipation (1), hemorrhoid (1), and appetizer (1).	11
114	*Elettaria cardamomum*	Zingiberaceae	SE	In	Digestive (3), stomachic, flatulence (4), hyperacidity (1), and stomachache (3).	9
115	*Zingiber officinale*	Zingiberaceae	RH	Pw, Co, De	For flatulence (16), abdominal pain (7), stomachache (2), constipation (2), appetizer (7), antiemetic (2), and digestive (1).	37
116	*Peganum harmala*	Zygophyllaceae	FU	De	For flatulence (7), constipation (6), stomachache (2), and toothache (1).	44

The most frequently used parts of these plants are the aerial parts (25%), followed by seeds, fruits (16% each), leaves (12%), roots and rhizomes (15%), flowers (9%), and most rarely, stem, bark, sap, tall, fixed oil resin and gum (1% each).

The plants are prepared and administered in different forms. The most important forms of preparation are powder (25%), infusion (23%), and decoction (17%), followed by maceration (9%), fresh (8%), cooked (7%), paste (3%), and poultice (2%). Rare forms of plant usage are juice, jam, dry eating, pill, and grinding.

The most important plant species reported for the treatment of diarrhea and dysentery are *Achillea wilhelmsii*, *Punica granatum*, *Descurainia Sophia*, *Alhagi pseudalhagi*, and *Elaeagnus angustifolia*, respectively. Seeds of Mango are used in the form of powder for the treatment of diarrhea.

The most important species for the treatment of constipation are *Descurainia sophia*, *Cassia fistula*, *Citrullus colocynthis*, *Terminalia chebula*, *Euphorbia megalocarpa*, and *Plantago major*. Among the mentioned species, the latex of *Euphorbia megalocarpa* is mixed with wheat flour and used as pills orally.

The most important medicinal plant for the treatment of peptic ulcers in our study area was *Glycyrrhiza glabra*. The most frequently used medicinal plants for the treatment of stomach aches and flatulence were *Achillea wilhelmsii*, *Foeniculum vulgare*, *Trachyspermum ammi*, *Carum carvi*, and *Anethum graveolens*. Other species in our study area considered to have carminative effects are *Levisticum officinale*, *Nigella sativa*, *Artemisia sieberi*, and *Ferula* sp.

The root of *Ferula* sp., which is called Burbu, Badra, and Badburak in the local language, is very popular all around the country. It is a fragrant medicinal plant and contains EO. People collect the fleshy roots from the high mountain of the Ghorband valley, especially from the heights of the mountains that separate Parsa valley from Frinjal and Lolinj. The dried roots can be found everywhere in the home and are mostly used in the fumigation form for the evil eye. In addition, it is used as an antiseptic as well as in the form of a powder mixture with Fennel and Ajowan for the treatment of gastrointestinal disorders. This plant mistakenly was reported as *Prangos pubularia* by Younos, et al., (1987) but it is completely different from the mentioned species and we identified it with the help of Prof. Breckle and Dr. Fritsch.

3.2.3.5 Medicinal plants are mainly used in the treatment of urinary and gynecological disorders

Urinary tract ailments have affected humans since antiquity. The occurrence of these ailments has increased in both rural and urban people. Among these diseases, urinary tract stones which are generated by the deposition of calcium, phosphates, and oxalates, may persist for an indefinite time, and cause secondary complications and painful problems to the patient. For the removal of these stones, common surgical procedures are required, but most patients don't like to undergo such kinds of surgeries. Besides, some literature mentions the reoccurrence of such stones with a rather high (50-80%) probability (Chauhan, et al., 2009). Therefore, finding new effective drugs for the treatment of such disorders is in urgent need. One of the important possibilities is the exploration of medicinal plants which are phytochemically and pharmacologically unknown or less known hitherto and are used by people living in remote areas.

Gynecological health is a very important component of a woman's health status. Gynecological disorders can have a considerable influence on many parts of the quality of life, counting reproductive ability, sexual functioning, mental health, and the ability to work and perform routine physical activities. However, little is currently known about the prevalence of these and other gynecological conditions in Afghanistan, and about the impact of these conditions on the healthcare system. The results of our study show that 42 out of 270 medicinal plants used in the traditional and folk medicine of the Parwan and Kabul areas are mainly applied for the treatment of various affections of urinary and gynecological disorders. These medicinal plants are given in Table 8 with their botanical affiliation to family, along with data on plant parts used, the methods of preparation and administration, frequency, and medicinal application of each species. These medicinal plants are mostly native and only a few species are imported from other countries. Taxonomically, these medicinal plants belong to 25 families, most often to Poaceae (6 species), Fabaceae (4 species), Amaranthaceae, Asteraceae, Brassicaceae (3 species each), Liliaceae, Rosaceae, and Anacardiaceae (2 species each). The most frequently used parts are aerial parts and seeds (19% each) followed by, fruits and flowers (13% each), leaves (11%), roots (9%), and peel (4%). In lower proportion, bark, tendrils, stigmata, pedicels, bulbs, fixed oil, and resin (2% each). These plants are administered in various preparation forms; the most important ones are infusion (28%), decoction (24%), fresh consumption (18%), maceration, powder (8% each), and juice (6%). In low proportions cooked (4%), raw consumption, and paste (2% each) are used.

Table 8 Medicinal plants used in urinary and gynecological disorders.

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
1	*Amaranthus retroflexus*	Amaranthaceae	IF	Ju	Gonorrhea (2) and menstrual bleeding (1).	5
2	*Spinacia oleracea*	Amaranthaceae	LE	Co, Ju	Gonorrhea (1).	3
3	*Allium cepa*	Amaryllidaceae	BU	Fr	For sexual problems (1), dysuria (2), bladder problems (1), kidney problems (1), and anti-inflammatory (1),	17
4	*Mangifera indica*	Anacardiaceae	FU	Fr	Male sexual desire enhancement (1).	13
5	*Pistacia atlantica*	Anacardiaceae	RE, LE	De, Pw	Amenorrhea (1).	1
6	*Nerium oleander*	Apocynaceae	LE	De	Diuretic (1).	1
7	*Cocos nucifera*	Arecaceae	FU	Fr, Ju	Infertility (1) and amenorrhea (1).	2
8	*Asparagus officinalis*	Asparagaceae	RO	De	Diuretic (1), to expel kidney and bladder stones (1).	3
9	*Carthamus tinctorius*	Asteraceae	FL	In	Emmenagogue (1).	1
10	*Artemisia scoparia*	Asteraceae	HE, SE	In	For urinary tract inflammation (1) and diuretic (1).	2
11	*Taraxacum officinale*	Asteraceae	HE, RO	In, Mc	Kidney problems (2).	7
12	*Borago officinalis*	Boraginaceae	FL	In	To expel kidney stones (9), nephritis (3), kidney problems (13), and bladder stones (1).	44
13	*Brassica oleracea*	Brassicaceae	LE	Fr	Aphrodisiac (1) and diuretic (1).	3
14	*Lepidium sativum*	Brassicaceae	HE	Fr	For gynecological problems (3) and aphrodisiacs (2).	3
15	*Raphanus raphanistrum*	Brassicaceae	RO	Fr	Diuretic (1).	2
16	*Capparis spinosa*	Capparaceae	FU, FL	In	For kidney disorders (4).	8
17	*Seidlitzia rosmarinus*	Amaranthaceae	HE	De	Diuretics (1), for abortion (1), and aid menstruation (1).	5

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
18	*Citrullus lanatus*	Cucurbitaceae	SE	Ra	Nephritis (2).	2
19	*Convolvulus arvensis*	Convolvulaceae	HE	In	For urinary disorders (4).	12
20	*Astragalus benzudensis*	Fabaceae	LE, RO	De, In	To expel kidney stones (5), kidney pain (4), nephritis (6), and gonorrhea (2).	13
21	*Avena sativa*	Poaceae	SE	De	For kidney disorders (3).	6
22	*Glycine max*	Fabaceae	SE, FO	Co	To expel kidney stones (1), for kidney pain (1).	2
23	*Trigonella foenum graecum*	Fabaceae	SE	Pw	For gynecological problems (10), aphrodisiac (3), and as lactogenic (1).	18
24	*Vicia faba*	Fabaceae	SE	De	For kidney pain (1), anti-inflammatory (1), stone removal (1), and diuretic (1).	4
25	*Juglans regia*	Juglandaceae	FS	In	For kidney disease (2), kidney pain (5), nephritis (3), cystitis (2), to expel kidney stones (6), and bladder stones (1).	47
26	*Nepeta juncea*	Lamiaceae	HE	In, Pw	Against amenorrhea (4), for menstruation pain (2), anti-arthritic (7), anti-infertility (6), against abortion (1), and gonorrhea (1).	30
27	*Fritillaria imperialis*	Liliaceae	FL	In	To expel kidney stones (1).	1
28	*Lilium candidum*	Liliaceae	HE, PE	In, Pa	For nephritis (1), gonorrhea (1), and aphrodisiac (1).	4
29	*Phoenix dactylifera*	Palmaceae	FU	Fr	For kidney disorders (4), against amenorrhea (1), premature birth (1), and for childbirth pain (1).	7
30	*Platanus orientalis*	Platanaceae	BA	De	To expel kidney stones (1) and kidney pain (1).	1

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
31	*Agropyron repens*	Poaceae	HE, RO	De	To expel kidney and bladder stones (4), for kidney pain (5), nephritis (1), gallstone (1), gonorrhea (1), prostatitis (1), and kidney problems (1).	10
32	*Hordeum vulgare*	Poaceae	SE	Mc	For nephritis (3), cystitis (2), kidney stones (2), and as an aphrodisiac (1).	7
33	*Panicum miliaceum*	Poaceae	SE	Mc	For gonorrhea (1), and preventing abortion (1).	3
34	*Secale cereal*	Poaceae	SE	Pw	For childbirth (1) and as abortive (1).	1
35	*Zea mays*	Poaceae	ST	In	To expel kidney stones (9), kidney pain (7), nephritis (8), kidney disorders (5), and UTI (2).	34
36	*Prunus cerasus*	Rosaceae	PE	De	For kidney disorders (40), urinary tract diseases (7), and diuretics (1).	58
37	*Prunus microcarpa*	Rosaceae	FU, SE	Fr, Pw	For kidney disorders (2).	7
38	*Digitalis purpurea*	Scrophulariaceae	FL	In	Diuretic (1).	1
39	*Tamarix ramossissima*	Tamaricaceae	FL	In	For nephritis (1) and anti-infertility (1).	4
40	*Urtica dioica*	Urticaceae	HE	De	For gonorrhea (19), kidney & bladder disorders (13), dysuria (5), diuretic (2), and prostatic hyperplasia (3).	52
41	*Vitis vinifera*	Vitaceae	LE, TE	Mc	For kidney problems (4).	19
42	*Tribulus terrestris*	Zygophyllaceae	HE, FU	De, Pw	For kidney disorders (12), cystitis (1), urinary tract stones (1), aphrodisiac (2), and gonorrhea (2).	20

Seventeen out of 42 plant species are used in the treatment of kidney stones. The most important species for the management of urinary disorders are *Prunus cerasus*, *Zea mays*, *Borago officinalis*, *Juglans regia*, *Astragalus bezudensis*, *Urtica dioica*, *Tribulus terrestris*, and *Equisetum arvense*. These plant species may prove a precious potential source of bioactive compounds of therapeutic value against urinary lithiasis and, hence, need critical scientific analyses, phytochemical examination, and clinical evaluation for these purposes. Also, 18 out of 42 plants species are used in the treatment of gynecological disorders, and the most important species are *Lepidium sativum*, *Trigonella foenum-graecum*, *Nepeta juncea*, *Secale cereale*, *Carthamus tinctorius*, *Cocos nucifera*, *Pistacia atlantica*, and *Mangifera indica*.

3.2.3.6 Medicinal plants are mainly used in the treatment of muscle-skeletal, toothache, rheumatism, and dermal disorders including hair, and eyes

The muscle-skeletal system gives humans the capacity to move their bodies. The term muscle-skeletal disorders are used to describe a variety of conditions that affect muscles, cartilage, tendons, ligaments, joints, and other connective tissues, which are usually progressive and associated with pain. Muscle-skeletal disorders are the most common cause of severe long-term pain and disability and lead to substantial healthcare and social support costs (Cavero & Calvo, 2015). Like other diseases, musculoskeletal disorders also affect the quality of life and are a major cause of the loss of work and disability, and also have a significant economic cost through lost productivity.

Rheumatism, which is marked by inflammation and pain in the joints, muscles, or fibrous tissue, especially rheumatoid arthritis, also belongs to the main illness among people. In western medicine, various agents, such as non-steroidal anti-inflammatories and opioids are used to treat these problems and medicinal plants can also be considered (Cavero & Calvo, 2015).

The dermis, which covers the whole body, has a rather important function for life, such as safeguarding, absorption, regulating heat, the preservation of fluids, responsiveness to stimuli, and the control of diseases. It is well known that medicinal plants play a significant role in the medical care of skin disorders (Abbasi, et al., 2010).

In this study, 86 out of 270 medicinal plant species recorded that mainly used for the above-mentioned problems. These medicinal plants are given in Table 9 with their affiliation to families, scientific names, parts used, preparations, uses, and frequency. Frequency also covers further indications.

Table 9 Medicinal plants used in the treatment of muscle-skeletal, dermal, and inflammatory disorders.

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
1	*Beta vulgaris*	Amaranthaceae	RO	Ra	Headache (1) and for hair loss (1).	1
2	*Seidlitzia rosmarinus*	Amaranthaceae	HE	De	Detergent (2) and hair tonic (3).	5
3	*Spinacia oleracea*	Amaranthaceae	LE	Co, Ju	Joints pain (1).	3
4	*Narcissus poeticus*	Amaryllidaceae	BU	Ru	For the freshness of the face (1).	1
5	*Pistacia vera*	Anacardiaceae	FU	Dy	For bone marrow diseases (1).	1
6	*Ferula diversivittata*	Apiaceae	RE	Pi	For foot cracking (1), anti-arthritic (1), and backache (1).	5
7	*Ferula ovina*	Apiaceae	RO	Mc	Against toothache (3).	5
8	*Pastinaca sativa*	Apiaceae	HE	De	Backache (1).	1
9	*Prangos pabularia*	Apiaceae	RO, SE	De	For bruises (1) and wound healing (1).	7
10	*Eremurus persicus*	Asphodelaceae	LE	In, Pa	Against foot pain (1).	2
11	*Artemisia scoparia*	Asteraceae	HE, SE	In Pw	Antigout (1), antirheumatic (1), skin and facial beauty (1), and wound healing in livestock (1).	2
12	*Carthamus tinctorius*	Asteraceae	FL	In	Antiparlytic (1), and anti-inflammatory (1).	1
13	*Centaurea behen*	Asteraceae	RO	De	Against backache (1).	1
14	*Matricaria chamomilla*	Asteraceae	HE, FL	In	Anti-inflammatory (8), eczema (2), and hair loss (4).	38
15	*Cousinia chionophila*	Asteraceae	LE, RO	De	For skin rejuvenation (1), antirheumatic (1), and antigout (1).	2
16	*Eclipta alba*	Asteraceae	LE, SE	In	Hair tonic (1).	1
17	*Inula helenium*	Asteraceae	RO	De, Mc	Anti-inflammatory (1).	1
18	*Tussilago farfara*	Asteraceae	LE	In	Anti-inflammatory (1) and antirheumatic (1).	1

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
19	*Berberis integerrima*	Berberidaceae	LE, RO	Mc, Po	For bone fracture (29), bruise (14), and wound healing (4).	90
20	*Arnebia afghanica*	Boraginaceae	RO	De, Pw	For muscle contraction (2) anti-inflammatory (1), burn (1), and antirheumatic (1).	10
21	*Trichodesm incanum*	Boraginaceae	LE	De, Pw	For wound healing (6), anti-inflammatory (1), acne (2), furuncle (1), dermal rashes (1), dermal corn (1), body abscess (1), bruises (1), and backache (1).	14
22	*Brassica nigra*	Brassicaceae	SE	Pw, Po	Against dermatitis (1).	3
23	*Brassica oleracea*	Brassicaceae	LE	Fr	For treatment of acne (1).	3
24	*Brassica juncea*	Brassicaceae	SE	Pw	Anti-arthritic (1) and skin disorders (2).	5
25	*Codonopsis clematidea*	Campanulaceae	LE	In	Fro backache (1) and foot pain (1).	1
26	*Saponaria griffithiana*	Caryophyllaceae	RO	Mc	As detergent for washing the head (1).	1
27	*Colchicum autumnale*	Colchicaceae	BU	Pi, Pw	Antigout (3), analgesic (5), anti-arthritic (2), rheumatism (2).	10
28	*Cucumis melo*	Cucurbitaceae	FU	Fr	Skin moisturizer for dry skin (1).	1
29	*Cucumis sativus*	Cucurbitaceae	FU	Fr	For skincare (3).	6
30	*Equisetum arvense*	Equisetaceae	HE	De	Against backache (5).	22
31	*Ricinus communis*	Euphorbiaceae	FO	Ru	Anti-arthritic (1) and against foot swelling (1).	4
32	*Astragalus ajfreidii*	Fabaceae	RO	De, Tb	For body aches (1), toothache (1), and teeth brushes (1).	3
33	*Cicer arietinum*	Fabaceae	SE	Rs	For strengthening abdominal muscles (1).	1
34	*Colutea paulsenii*	Fabaceae	FO	Ru	For dermal diseases (1).	1
35	*Entada rheedii*	Fabaceae	SE	De, Pw	Against backache (4), anti-arthritic (3), skin diseases (1), wound healing (1), and muscle crack (1).	5

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
36	*Vicia lens*	Fabaceae	SE	Co	Muscle tonic (1).	1
37	*Medicago sativa*	Fabaceae	HE	In, Po	Anti-inflammatory (1), contusion (2), and dermatitis (2).	8
38	*Melilotus officinalis*	Fabaceae	HE	In	Anti-inflammatory (1).	1
39	*Senna alexandrina*.	Fabaceae	LE	De	Wound healing (1) and antirheumatic (1).	2
40	*Vicia faba*	Fabaceae	SE	Co, De	Anti-inflammatory (1), abscess (1), and acne (1).	4
41	*Corydalis gortschakovii*	Fumariaceae	HE	In, Pw	For wounds (2), bone fractures (2), and anti-inflammatory (1).	4
42	*Fumaria officinalis*	Fumariaceae	HE	In	For dermal disorders (19) and acne (13).	37
43	*Hymenocrater sessilifolius*	Lamiaceae	HE	In, Pw,	For body aches (9), backache (2), and muscle contraction (3).	43
44	*Marrubium anisodon*	Lamiaceae	HE	Pw Po	Anti-inflammatory (6), wound healing (3), and dermatitis (1).	13
45	*Nepeta glutinosa*	Lamiaceae	HE	In	Against backache (6), bone fracture (16), contusion (3), analgesic (14), anti-arthritic (4), and antirheumatic (3).	33
46	*Nepeta juncea*	Lamiaceae	HE	In, Pw	For headache (2), analgesic (12) and backache (3).	30
47	*Nepeta podostachys*	Lamiaceae	HE	In, Pw	For muscle pain (3) and headache (1).	3
48	*Perovskia atriplicifolia*	Lamiaceae	FL	In, Pw	For body aches (6), wound healing (1), and foot pain (3).	18
49	*Prunella vulgaris*	Lamiaceae	LE	In	Antirheumatic (2) and dermal diseases (3).	6
50	*Salvia haematodes*	Lamiaceae	HE, RO	De, Pw	Against backache (2), foot pain (1), and wound healing (1).	5
51	*Salvia macrosyphon*	Lamiaceae	HE, SE	De, Pw	For dermal acne (3), and wound healing (1).	9
52	*Salvia rhytidea*	Lamiaceae	HE	De	Against headache (2), anti-inflammatory (2) for backache (2), and antirheumatic (1).	25
53	*Stachys parviflora*	Lamiaceae	HE	De	For treatment of contusion (3), dermal disorders (1), and antirheumatic (1).	14

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
54	*Cinnamomum verum*	Lauraceae	BA	De, Pw	Wound healing (4), antirheumatic (1), anti-arthritic (2), and for acne (3).	21
55	*Lilium candidum*	Liliaceae	HE, PE	In, Pa	For dermal abscess (1), burns (1), and muscle tonic (2).	4
56	*Linum usitatissimum*	Linaceae	FO	Ru	For treatment of dermatitis (2) and bone fractures (1).	5
57	*Lawsonia inermis*	Lythraceae	LE	Pa	Wound healing (1), antirheumatic (1), foot cracks (1), and cosmetic (2).	3
58	*Gossypium hirsutum*	Malvaceae	FO	Po	For abscess (2), wounds (1), anti-arthritic (1), and warts (1).	3
59	*Malva neglecta*	Malvaceae	HE, RO	Po, In	Anti-inflammatory (7), wound healing (2), dermal disorders (8), demulcent (1), and against conjunctivitis (1).	47
60	*Fraxinus xanthoxyloides*	Oleaceae	LE, FL	In, Pw	Antigout (1), antirheumatic (1), and dermal problems (2).	2
61	*Olea europaea*	Oleaceae	FO	Ru	Antirheumatic (4), body lotion (3), and rachitis (1).	14
62	*Phoenix dactylifera*	Palmaceae	FU	Fr, Dy	For osteoporosis (1), bone fracture (1), facial vivacity (1), hair growth (1), backache (1), and anti-arthritic (1).	7
63	*Glaucium flavum*	Papaveraceae	LE	In, Pw	Wound healing (5).	6
64	*Piper nigrum*	Piperaceae	FU	Pw	Anti-inflammatory (1) and anti-arthritic (1).	6
65	*Plantago major*	Plantaginaceae	SE	Po	Wound healing (8) and dermal rashes (8).	94
66	*Dionysia tapetodes*	Primulaceae	FL	In	Antirheumatic (1).	2
67	*Zizyphus spina-christi*	Rhamnaceae	LE	De	For washing the dead body (1), hair tonic (1).	1
68	*Amygdalus commonis*	Rosaceae	FO	Ru	Against dermal rashes (1).	4
69	*Malus domestica*	Rosaceae	LE	Fr, In	Anti-arthritic (2), antirheumatic (3), and antigout (2).	12

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
70	*Prunus armeniaca*	Rosaceae	GU	De, Pw	Against backache (4), body aches, antirheumatic (1), anti-arthritic, for dermal beauty (1), and hoarseness (1).	7
71	*Prunus persica*	Rosaceae	LE, SE	Ju, Pw	Wounds in livestock (1), anti-arthritic (1), and backache (1).	13
72	*Pyrus communis*	Rosaceae	FU	Ju	For skin disorders (2).	2
73	*Citrus limon*	Rutaceae	FU	Fr, Ju	Against acne (2), dermal beauty (2), and antirheumatic (1).	8
74	*Populus alba*	Salicaceae	BA, LE	De, Po	Anti-arthritic (1), abscess (1), and dermal disorders (1).	4
75	*Verbascum thapsus*	Scrophulariaceae	LE, FL	In, Po	Anti-inflammatory (5), anti-arthritic (1), for treatment of acne (2), and bone fracture (2).	21
76	*Capsicum annum*	Solanaceae	FU	Fr, Pw	Antirheumatic (2).	4
77	*Capsicum annuum* Group	Solanaceae	FU	Fr, Pw	Against toothache (2).	2
78	*Datura stramonium*	Solanaceae	LE	In, Pw,	Analgesic (3), antirheumatic (1), and anti-inflammatory (1).	10
79	*Nicotiana tabacum*	Solanaceae	LE	Ju, Pa	Insecticide (1), and anti-inflammatory (1).	2
80	*Solanum lycopersicum*	Solanaceae	FU	Fr, Po	Demulcent (1), for burn (1), and anti-inflammatory (1).	2
81	*Solanum nigrum*	Solanaceae	FU, LE	Fr, In	Antirheumatic (1), against urticaria (1), and wounds (1).	11
82	*Tamarix ramossissima*	Tamaricaceae	FL	In	Against toothache (2).	4
83	*Ulmus minor*	Ulmaceae	RO	Pw	For dermal diseases (2).	2
84	*Curcuma longa*	Zingiberaceae	RH	Pw, Po	For bone fracture (4), bruises (3), and analgesic (7).	27
85	*Curcuma aromatica*	Zingiberaceae	RH	Pw, Po	Antirheumatic (1), foot, and hand pain (1).	11
86	*Zingiber officinale*	Zingiberaceae	RH	Pw, De, Po	Against bone pain (2), myalgia (1), backache (4), anti-arthritic (7), foot pain (3), antirheumatic (6), and dermatitis (1).	37

These medicinal plants belong to 38 families, most often to Lamiaceae (11 species), Fabaceae (9 species), Asteraceae (8 species), Solanaceae (6 species), Rosaceae (5 species), Apiaceae (4 species), Amaranthaceae, Brassicaceae, Zingiberaceae (3 species each), Boraginaceae, Fumariaceae, Malvaceae and Oleaceae (2 species each). The most often used parts of these plants are leaves (22%), aerial parts (20%), fruits (11%), seeds (12%), roots (13%), flowers (7%), and fatty oil (6%). The most important forms of preparation are infusion and powder (22% each), infusion (21%), decoction (17%), poultice (10%), fresh eating (9%), rub (5%), paste and maceration (3% each). The most often used excipients of poultices were egg yellow, sheep fat, mustard, and olive oils.

This very wide variety of traditional uses of medicinal plants in the area accounts for more than 31% of the total medicinal plants of the region, indirectly showing the prevalence of these diseases among the population of the region.

3.2.3.7 Medicinal plants are mainly used in the treatment of infectious diseases and heat-related illness

Due to instability, conflicts, and civil war, people suffer poverty in Afghanistan, since 1978, and nearly 36% of the population is under the poverty line. Moreover, access to health facilities, clean water and hygiene, vaccine coverage, food security, nutrition, and so on is insufficient. Therefore, the prevalence of infectious diseases, especially among children is high. The mortality rate for children under five years of age is estimated at around 99 per 1000 live births, whereas the infant mortality rate has been reported to be 71 per 1000 live births (Anwar & Brunham, 2016). However, due to the limitation of systematic data in the country, it is difficult to measure the precise prevalence of such diseases. Heat illness such as heat cramps, heat exhaustion, or in severe cases “heatstroke”, which is also called sunstroke is a kind of severe health problem, that results from a body heat of more than 40 °C and confusion (Gaudio & Grissom, 2016), are dangerous circumstances in which the system of heat-regulating of the body fails because of exposure to high temperatures. It occurs when people are doing hard work or activities under the sun or in a hot environment. As the area has an arid climate with hot and dry summers, many farmers are exposed to the sun during work in the fields and suffer such harmful conditions. Our informants reported 34 medicinal plants, which mainly used for management of above-mentioned affections which are listed in Table 10 with their affiliation to families, scientific names, parts used, preparation, popular uses, and frequency. Frequency also covers further indications.

Table 10 *Medicinal plants are mainly used in the treatment of infectious and heat-related eye diseases.*

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
1	*Sambucus racemosa*	Adoxaceae	FU	De	Antipyretic (1) and antiseptic (1).	1
2	*Allium cepa*	Amaryllidaceae	BU	Fr	Antimicrobial (3), otitis (3), and antiseptic (1).	17
3	*Allium sativum*	Amaryllidaceae	BU	Fr	Antiseptic (3) and antibacterial (2).	35
4	*Heracleum afghanicum*	Apiaceae	LE, RO	Cv, Mc	Against typhoid (2), heatstroke (1), and antipyretic (1).	19
5	*Pimpinella* sp.	Apiaceae	HE	In, Pw	To treat heatstroke symptoms (2).	7
6	*Cocos nucifera*	Arecaceae	FU	Fr, Ju	Antituberculotic (1).	2
7	*Cichorium intybus*	Asteraceae	RO	Mc	Against typhoid (33), heatstroke (16) antipyretic (38), and antimalarial (15).	155
8	*Cirsium vulgare*	Asteraceae	RO	Mc	Antipyretic (1) and against typhoid (1).	2
9	*Cousinia umbrosa*	Asteraceae	LE, RO	In, Mc	Against insect bite (1).	1
10	*Inula helenium*	Asteraceae	RO	De, Mc	Antiseptic (1).	1
11	*Senecio glaucus*	Asteraceae	HE	De	Antipyretic (2).	2
12	*Descurainia sophia*	Brassicaceae	SE	Co, Mc	To treat heatstroke symptoms (14).	86
13	*Carica papaya*	Caricaceae	FU	Fr	Diphtheria (1).	1
14	*Citrullus colocynthis*	Cucurbitaceae	FU	Pw	Antibiotic (3), antimicrobial (3), and amoebicide (1).	16
15	*Euphorbia granulata*	Euphorbiaceae	HE	De	To treat nyctalopia (1).	1
16	*Astragalus ajfreidii*	Fabaceae	RO	De, Pw	Antipyretic and against typhoid (1).	3
17	*Corydalis gortschakovii*	Fumariaceae	SE	In, Pw	To treat nyctalopia (1).	7

#	Scientific names	Family	PU	PR	Use (number of use reports)	FQ
18	*Salvia officinalis*	Lamiaceae	HE	In	Antibacterial (1).	1
19	*Origanum vulgare*	Lamiaceae	HE	In	Antiviral for mumps (1), red swelling of the breast (1), and redness of the face due to allergy (1).	2
20	*Eucalyptus globulus*	Myrtaceae	LE	De	Antipyretic (1), antibacterial (1), and mouthwash antiseptic (2).	2
21	*Plantago lanceolata*	Plantaginaceae	LE	In, Po	Against influenza (2), antipyretic (3), and heatstroke (4).	31
22	*Portulaca oleracea*	Portulacaceae	HE	Co	Against typhoid (1), heatstroke symptoms (1), antimalarial (1), taeniacid (1), and antimicrobial (1).	12
23	*Ranunculus olgae*	Ranunculaceae	HE	In, Pw	Against typhoid (1) and measles (1).	9
24	*Prunus persica*	Rosaceae	LE	Ju, Pw	To treat infectious wounds in livestock (1), and disinfectant (1).	13
25	*Cinchona pubesceas*	Rubiaceae	BA	Mc	Antipyretic (1).	1
26	*Populus alba*	Salicaceae	BA, LE	De, Po	For the treatment of snakebite (1), and antipyretic (2).	4
27	*Salix alba*	Salicaceae	LE, RT	De, Cv	Antipyretic (15), against typhoid (5), antimalarial (5), and heatstroke symptoms (13).	40
28	*Capsicum annuum*	Solanaceae	FU	Fr, Pw	Antimicrobial (2).	2
29	*Nicotiana tabacum*	Solanaceae	LE	Ju, Pa	Insecticide (1).	2
30	*Solanum nigrum*	Solanaceae	FU, LE	In, Sm	Antipyretic (3) and for the treatment of infected wounds (1).	11
31	*Verbena officinalis*	Verbenaceae	FL	In	Antipyretic (1), antimalarial (1).	1
32	*Vitis vinifera*	Vitaceae	LE	Fr, Po	To treat heatstroke symptoms (3) and antipyretic (1).	19
33	*Peganum harmala*	Zygophyllaceae	FU	De, Sm	Antiseptic (5), against the “Evil eye” (7), and antimicrobial (9).	44

These 33 medicinal plants are mostly native and only 3 species are imported from other countries. These medicinal plants belong to 23 families and are mostly members of Asteraceae (5 species), Solanaceae (3 species), Apiaceae, Amaryllidaceae, Lamiaceae, and Salicaceae (2 species each). The most often used parts are leaves (26%), herbs, fruits (18% each), roots (16%), bulbs, seeds and bark (5% each), flower, and rootlets (3% each). These plants are used in various preparation forms mostly by infusion, decoction (18% each), fresh, maceration, and powder (13% each), juice and poultices (6% each), smoke, coverage, and cooked forms (4% each), and paste (2%).

The risk of malaria is present around the whole country, generally limited to the warmer months with seasonal variations. Our informants indicated *Cichorium intybus* and *Salix* spp. for the treatment of malaria fever and typhoid and also *Heracleum afghanicum* for typhoid as major plant remedies. Another infectious health problem among the Afghan population is tuberculosis. Afghanistan is one of the highest investing countries in the world which made effort to get rid of tuberculosis (GDIN, 2001). Our informant suggested only coconut (*Cocos nucifera*) for this illness.

Poliomyelitis is another infectious disease reported in Afghanistan, which is transmitted via the fecal-oral route and is a serious health threat, particularly for children. The polio control program is of top priority to the Ministry of Public Health in Afghanistan and the polio vaccine campaign is an ongoing relief effort every year. However, polio still has not been eliminated and remained in the south and eastern parts of the country. In 2018, 21 cases of polio were reported in the southern and eastern 6 provinces of Afghanistan (WHO, 2019a). Minor cases of rabies also occur annually in humans and animals, but our informants did not report any medicinal plants for the mentioned infectious, maybe due to the lack of occurrence of such diseases in these regions. Measles is a highly communicable viral disease (WHO, 2019b).

Heat-related illnesses with symptoms of headache, dizziness, a lack of sweating, red and dry skin, muscle weakness, nausea, vomiting, and rapid heartbeat are common among the population in the rural area of Kabul and Parwan provinces. During this season inhabitants, work in their fields and harvest their agricultural products, or are collecting plants from the mountains for feeding their livestock during the winter, so they experience this illness. In such conditions, general measures like putting the ill person in cool water, drinking cold water, and other liquids such as buttermilk, cover the body of the ill person with *Heracleum*, *Salix,* or

grape leaves. Besides, other medicinal plants preferably *Descurainia sophia*, *Salix* alba, *Plantago lanceolata,* and *Vitis vinifera* are also used.

3.2.3.8 Medicinal plants are mainly used for the treatment of diabetes

Diabetes mellitus is a very widespread disease among the people of the world, and 25% of the world's inhabitants are struggling with this disease. It is caused by the irregularity of carbohydrate metabolism which is connected to a low level of insulin in the blood or insensitivity of target organs to insulin (Arumugam, et al., 2013). In the human body, blood glucose is controlled by two hormones called insulin and glucagon in a low range. The glucagon releases glucose from liver cells into the bloodstream. Insulin controls the conversion of glucose into glycogen and its storage in liver cells.

Diabetes is classified into two types (type-1 and type-2). Type-2 diabetes frequently occurs in people with obesity and is rather often associated with hypertension and hyperlipidemia. While, Type-1 diabetes is diagnosed with the incapability of insulin release and results in low amounts of glucose uptake into muscles and adipose tissue (Arumugam, et al., 2013).

In conventional medicine, there are many antidiabetic agents such as alpha-glucosides inhibitors (acarbose, miglitol), amylin analogs (pramlintide), and dipeptidyl peptidase 4 inhibitors (alogliptan, linagliptan, saxagliptin, and sitagliptin), and different insulins. However, investigation for new agents continues because of the current restrictions on synthetic drugs. Therefore, medicinal plants with antidiabetic properties will be good candidates for the development of new pharmaceuticals.

In this study, we found that 14 out of 270 species of medicinal plants were mainly used for the management of blood sugar and its secondary complications. Thirteen out of 14 plant species are used because of their antihyperglycemic potential and are known among the people in the study area while one out of 14 species is used in hypoglycemia (not surprising that this is *Saccharum officinarum*). The most important medicinal plants for the management of high blood sugar in our study area were found to be *Centaurea pulchella* and *Artemisia absinthium*. These 14 medicinal plants with claimed important antidiabetic properties belong to 9 families, mainly represented by Asteraceae (4 species), Cucurbitaceae and Rosaceae (2 species each). These plants are given in Table 11 with their affiliation to families, scientific names, parts used, preparation, popular uses, and frequency. Frequency also covers further indications of these plants.

Table 11 *Medicinal plants are mainly used in the management of diabetes.*

#	**Scientific names**	**Family**	**PU**	**PR**	**Use (number of use reports)**	**FQ**
1	*Helianthus petiolaris*	Asteraceae	RO	Co	Antidiabetic (2)	2
2	*Cousinia buphthalmoides*	Asteraceae	RO	De, Pw	Antidiabetic (1)	5
3	*Artemisia absinthium*	Asteraceae	HE	In	Antidiabetic (23)	70
4	*Centaurea pulchella*	Asteraceae	FL	In	Antidiabetic (12)	26
5	*Cactus dillenii*	Cactaceae	FU	Fr	Antidiabetic (1)	1
6	*Citrullus colocynthis*	Cucurbitaceae	FU	De, Pw	Antidiabetic (5)	16
7	*Momordica charantia*	Cucurbitaceae	FU	Co	Antidiabetic (1)	1
8	*Vaccinium macrocarpon*	Ericaceae	FU	In	Antidiabetic (1)	1
9	*Ribes orientale*	Grossulariaceae	FU	De	Antidiabetic (1)	1
10	*Morus alba*	Moraceae	FU	Fr, Dy	Antidiabetic (1)	2
11	*Saccharum officinarum*	Poaceae	SM	Ju	Antihypoglycemic (2)	3
12	*Prunus koelzii* (*Amygdalus koelzii*)	Rosaceae	FO	Co	Antidiabetic (2)	2
13	*Fragaria* × *ananassa*	Rosaceae	FU	Fr	Antidiabetic (1)	1
14	*Capsicum annuum*	Solanaceae	FU	Fr, Pw	Antidiabetic (2)	2

4 DISCUSSION

4.1 Secondary metabolites are known for the investigated species

The biological properties of medicinal plants are attributed to the presence of active secondary metabolites. These metabolites play various roles in the plant such as protecting the plant against herbivores and attracting pollinators and seed dispersers. Some of them reduce the growth of nearby competing plants, absorb harmful ultraviolet radiation, and so on. Extensive progress has been made in the isolation and identification of the plant's secondary metabolites. Approximately 170,000 compounds have been identified from a limited number of species investigated so far, with a huge number of plants yet continuing to be fully examined and there are 100 naturally derived compounds being evaluated for clinical trials with 31 of them in phase III or registration at the end of 2013. This shows that medicinal plants play an important role in drug discovery (Badal & Delgoda, 2017). It is important to mention that most of the above investigations belong to medicinal plants of developed countries and very little is known about medicinal plants from developing countries such as Afghanistan.

The medicinal plants recorded in this study were divided into 3 groups according to their frequency of citation: group I (very frequently used plants, cited by more than 10 informants): 87 medicinal plants, 32% of all species recorded; group II (frequently used plants, cited by 5 - 10 informants): 56 plants, 21% of all species recorded; and group III (less frequently used plants cited by less than 5 informants): 127 plants, 47% of all species recorded, during the survey (Figure 30).

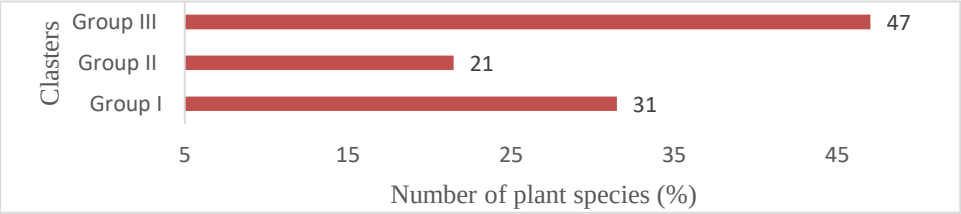


Figure 30 *Statistics of medicinal plants used in our study area based on their frequency of use.*

Here, the group I was chosen for further study, and a literature review regarding their major compounds and pharmacological effects were conducted. The results thereof are briefly indicated in Tables 12 and 14, respectively. The data collected in the mentioned tables were summarized mostly from 1: (PDR, 2007) and 2: (Keusgen, et al., 2020). Other references used in the above tables are indicated by (*) and the plant species are ordered based on the increase in their frequency of citation.

Table 12 *Major compounds of very frequently used medicinal plants in our study area.*

#	Scientific name	PU	Major compounds	FQ	Ref.
1	*Agropyron repens*	RO	Mucilages, triticin (polyfructosan), sugar alcohols, soluble silicic acid. EO including carvacrol and carvone-containing phydroxyalkyl cinnamic acid alkyl ester.	11	1
2	*Ziziphus jujuba*	FU	The fruit contains several minerals, vitamins, flavonoids (quercetin, rutin, and kaempferol), tri-terpenoids, and the isoflavone puerarin ziziphin found in the leaves. The seeds also contain phenyl glycosides and alkaloids.	11	2
3	*Solanum nigrum*	LE, FU	Steroid alkaloid glycosides: solasonine, solamargine, P-solamargine.	11	1
4	*Curcuma zedoaria*	RH	Volatile oil (3-5%): (α- and β-tumerone, α- and δ-atlantone, curlone, zingiberene, curcumol); curcuminoids (3-5%): curcumin, demethoxy curcumin, bidemethoxy curcumin, 1, 5-diaryl-penta-1, 4-dien-3-one derivatives; starch (30-40%).	11	1
5	*Convolvulus arvensis*	HE	All plant parts contain tropane, pseudo-tropine, tropinone alkaloids, and pyrrolidine alkaloid cuscohygrine. Further on, cardio-vascular-active glycosides and in the roots up to 5% resins (convolvine, jalapine, convolvuline, caffeic acid) have also been reported. The herb contains flavonoids, caffeic acid, carotene, and vitamin C.	12	2
6	*Polygonum bucharicum*	HE	Data not available.	12	
7	*Portulaca oleracea*	HE	Flavonoids, alkaloids, polysaccharides, fatty acids (rich in omega 3-fatty acids), terpenoids, sterols; leaves, and stems contain much oxalic acid.	12	2
8	*Malus domestica*	FU	Organic acids (0.2 to 1.5%); quinic acid, citric acid, succinic acid, lactic acid; caffeic acid derivatives; aromatic substances; pectins, tannins, vitamins mainly ascorbic acid (3 to 30 mg%).	12	1
9	*Mangifera indica*	SE	Polyphenols (79.5%) and carbohydrates (21.7%) (Kabuki, et al., 2000).	13	*

#	Scientific name	PU	Major compounds	FQ	Ref.
10	*Terminalia chebula*	FU	Tannins (20 to 45%): gallotannins, such as terchebulin, terflavin A, punicalagin, corilagin, chebulic acid, and chebulinic acid; sugar (9%): D-glucose, D-fructose, saccharose; fruit acids: quinic acid (1.5%), shikimic acid (2%); fatty oil (in the seeds, to 40%).	13	1
11	*Astragalus bezudensis*	RO	Other species such as *A. membranaceus contain* triterpenes glycosides; saponins (astragalosides); sterols (daucosterol and beta-sitosterol) and isoflavonoids.	13	1
12	*Cassia fistula*	FU	Anthracene derivatives (1% in the mesocarp): sennosides, fistulinic acid; citric acid; steroids.	13	1
13	*Marrubium anisodon*	HE	The aerial parts contain an EO (0.05%), flavonoids, the alkaloid stachydrine, resins, mucilage, diterpenoids (vulgarol and marrubiin), polysaccharides, tannins, phenols, coumarins, and saponins.	13	2
14	*Crataegus songarica*	LE, FU	Flavonoides (1.8%): hyperoside (0.28%), rutin (0.17%); oligomeric proanthocyanidins (2.4%); triterpenes (0.6%): oleanolic acid, ursolic acid, 2-alpha-hydroxy oleanolic acid (crataegolic acid).	13	1
15	*Prunus persica*	GU, LE, SE	Seeds contain cyanogenic glycosides, amygdalin and prunasin, sterols, persicaside alkaloids (Rho, et al., 2007).	13	*
16	*Trichodesma incanum*	LE	All plant parts and especially the seeds contain highly poisonous pyrrolizidine alkaloids (incanine).	14	2
17	*Stachys parviflora*	HE	Polyphenolic compounds, and diterpenoids; EO with α-terpenyl acetate (24%), β-caryophyllene (17%), bicyclogermacrene (9%), spathulenol (5%), and α-pinene (4%) as the major components (Shakeri, et al., 2019).	14	2, *
18	*Olea europaea*	LE	Iridoids monoterpenes: oleuropein (6-9%), 6-O oleoropinesaccharose, ligstroside, oleoroside, oleoside-7, 11 dimethylether; triterpenes: oleanolic acid, maslinic acid;	14	1

#	Scientific name	PU	Major compounds	FQ	Ref.
			flavonoids: luteolin-7-O-glucoside, apigenin-7-O glucoside; chalcones: olivin, olivin-4'-0-diglucoside.		
19	*Citrullus colocynthis*	FU	Cucurbitacins: including cucurbitacin E-, J-, L-glucosides; caffeic acid derivatives: chlorogenic acid; fatty oil (in the seeds).	16	1
20	*Ficus carica*	FU	Furanocoumarins: including psoralen, bergapten; fruit acids (citric acid, malic acid); sugars (ca. 50%); mucilages, pectin, vitamins B, and C.	16	1
21	*Syzygium aromaticum*	FL	EO (15-21%): eugenol (70-90%), eugenyl acetate (17%), β-caryophyllene (5-12%); flavonoids: astragalin, isoquercitrin, hyperoside, quercetin-3, 4'-di-0-glycoside; tannins (10%): ellagitannins, eugenin; triterpenes: oleanolic acid (1%), crataegolic acid (maslic acid, 0.15%); steroids: sterols, including beta-sitosterol.	16	1
22	*Cydonia oblonga*	SE	Cyanogenic glycosides in the seeds: amygdalin (corresponding to 0.4 -1.5% HCN); mucilages; fatty oil.	16	1
23	*Allium cepa*	BU	Isoalliin (alkyl cysteine sulphoxides) and further cysteine sulphoxides and its gamma-glutamyl conjugates; fructosans (10-40%), saccharose and other sugars; flavonoids (spiraeoside); steroid saponins.	17	1
24	*Pleurotus eryngii*	TA	Polysaccharides, lipopolysaccharides, proteins, peptides, glycoproteins, nucleosides, triterpenoids, lectins, lipids, and their derivatives (Patel, et al., 2012).	17	*
25	*Trigonella foenum-graecum*	SE	Mucilages (25-45%, mannogalactans); proteins (25-30%); proteinase inhibitors; steroid saponins (1.2-1.5%): including trigofoenosides A to G, aglycones including diosgenin, yamogenin, gitogenin, smilagenin, tigogenin, yuccagenin; Steroid saponin-peptide ester; sterols; flavonoids; trigonelline (0.4%); EO (0.01%).	18	1
26	*Perovskia atriplicifolia*	HE	EO with the main constituents of camphor (29%), limonene (17%), α-globulol (10%), trans-caryophyliene (9%), and α-humulene (9%). diterpene glucosides, phenolic constituents (perovskoate and perovskoside), caffeic acid, ferulic acid, and different flavonoids have been reported.	18	2

#	Scientific name	PU	Major compounds	FQ	Ref.
27	*Heracleum afghanicum*	SE, LE, RO	Phototoxic furocoumarins and oxycoumarins are accompanied by flavonoids and saponins. EO from fruits (1.5% with hexyl butanoate 34%, octyl acetate 21% and octyl butanoate 7%) and leaves (0.25-0.4% with mainly anethol).	19	2
28	*Vitis vinifera*	LE	Flavonoids (4 to 5%): kaempferol, quercetin-3-O-glucosides; tannins: procyanidolic oligomers (proanthocyanidins), including constituent monomers of catechin epicatechin; non-flavonoids (stilbenes): resveratrol and viniferins; fruit acids: including, tartaric acid, malic acid, succinic acid, citric acid, oxalic acid; phenyl acrylic acid derivatives: p-cumaroyl acid, caffeoyl acid, feruloylsuccinic acid.	19	1
29	*Carum carvi*	SE	FO, polysaccharides, proteins, furocoumarins (traces). EO with particular D-(+)-carvone and D-(+)-limonene.	20	1
30	*Cannabis sativa*	HE	Cannabinoids: especially 9- tetrahydrocannabinol (9-THC), in addition to 60 additional cannabinoids; EO (caryophyllenes, humules, caryophyllene oxide, α-pinenes, β-pinenes, limonene, myrcene, betaocimene); flavonoids including canniflavones.	20	1
31	*Papaver somniferum*	RE	Isoquinoline alkaloids (20-30%): morphine (3-23%), narcotine (2-10%), codeine (0.2-3.5%), papaverine (0.5-3%), thebaine (0.2-1%). The alkaloids are present as salts of meconic acid, lactic acid, or fumaric acid. Benzyl isoquinoline type alkaloids: papaverine (0.5 to 3%), phthalide isoquinoline type: narcotine.	20	1
32	*Tribulus terrestris*	HE	All plant parts contain flavonoids, saponins, and tannins, the fruits also have alkaloids, EO, linoleic acid, and further compounds.	20	2
33	*Ziziphora clinopodioides*	HE	The EO from the herb contains as main constituents pulegone (34%), piperitenone (15%), 1-8- cineole (7%), neo-menthol (6%), menth-2-en-1-ol (5%), menthol (5%), carvacrol (5%), and menthone (5%); the relative amounts may vary. The herb also has saponins, coumarins, and flavonoids; the seeds are fatty oil.	21	2

#	Scientific name	PU	Major compounds	FQ	Ref.
34	*Cinnamomum zylanium*	BA	Trans-cinnamaldehyde (62.79%), limonene (8.31%), eugenol (7%), and cinnamaldehyde propyleneglycol acetal (5.5%) (Simić, et al., 2004).	21	*
35	*Verbascum thapsus*	FL	Mucilage (3%); triterpene saponins: verbascosaponine; iridoide monoterpenes aucubin, β-xylosylaucubin, catalpol, isocatalpol, methyl catalpol; caffeic acid derivatives: verbascoside (acteoside); flavonoids (0.5-4.0%): rutin, hesperidine, diosmin; quercetin, apigenin, and kaempferol in the form of-7-O-glucoside.	21	1
36	*Equisetum arvense*	HE	Flavonoids: (0.6 - 0.9%): apigenin, kaempferol, luteolin, quercetin in the form of glycosides; caffeic acid ester (up to 1%): chlorogenic acid, dicoffeoyl-meso-tartaric acid; silicic acid (5 to 7.7%); pyridine alkaloids: nicotine (traces), palustrine (in the gametophytes and the rhizome styrolpyrone glucosides, including quisetumpyrone).	22	1
37	*Ocimum basilicum*	HE	EO: chavicol methyl ether (estragole), linalool, and eugenol; caffeic acid derivatives; flavonoids.	22	1
38	*Rheum ribes*	RH	Anthracene derivatives (3-12%): glycoside of rheum emodin, aloe-emodin, rhein, chrysophanol, physcion (together 60-80%), dianthrones (10-25%), sennosides A and B; tannins: gallo tannins, including among others galloyl glucose, galloyl saccharose, lindleyine, isolindleyine; flavonoids (2-3%); naphthohydroquinone glycosides.	22	1
39	*Crocus sativus*	ST	Apocarotinoid glycosides: crocin (crocetin-β-digentiobioside), colored intensive yellow-orange; picrocrocin (glycosidic bitter principle, up to 4%): the apocarotinoids and picrocrocin are presumably breakdown products of a carotenoid-digentiobioside-diglucoside (protocrocin); volatile oil (0.4 to 1.3%): safranal, 4-hydroxy-β-cyclocitral (breakdown products of the picrocrocin); carotenoids: lycopene, α-, β-, δ-carotene.	24	1

#	Scientific name	PU	Major compounds	FQ	Ref.
40	*Brassica rapa* subsp. *rapa*	RO	Mustard oil glycosides give a pungent flavor to all plant parts and may cause antibiotic properties. The fleshy taproots and stem bases contain little carbohydrates and protein, some vitamins and minerals like calcium and manganese, and xanthophylls (lutein).	25	2
41	*Salvia rhytidea*	HE	The plant contains biologically active diterpenes; the EO from leaves and herbs has a high content of hydrocarbon and oxygenated monoterpenes, among them spathulenol, pulegone, sabinene, and copaene.	25	2
42	*Rumex crispus*	RO	Oxalates: oxalic acid, calcium oxalate; tannins (3-6%); flavonoids: quercitrin; anthracene derivatives (0.9-2.5%): anthranoids, aglycones physcion, chrysophanol, emodin, aloe-emodin, rhein, their glucosides; naphthalene derivatives: neopodin 8-glucoside, lapodin.	25	1
43	*Coriandrum sativum*	FU	EO (0.4 - 1.7%): D-(+)-linalool (coriandrol, 60 to 75%). Borneol, p-cymene, camphor, geraniol, limonene, and α-pinene; fatty oil (13 to 21%): chief fatty acids petroselic acid, oleic acid, linolenic acid; hydroxycoumarins: umbelliferone, scopoletin.	26	1
44	*Centaurea pulchella*	FL	Other species such as *C. depressa* contain organic acids like rosmarinic acid, gallic acid, quinic acid, salicylic acid, caffeic acid, and p-coumaric acid; flavonols like rutin, hesperidin, hyperoside, quercetin, luteolin, and kaempferol. The EO of the aerial parts with piperitone (35%), elemol (14%), β-eudesmol (7%), spathulenol (5%), caryophyllene oxide (4%), and hexadecanoic acid (4%). However no data available for this species up to date.	26	2
45	*Cuminum cyminum*	SE	EO (2 to 5%): mainly cumin aldehyde, γ-terpenes, β-pinenes, p-cymene, 1, 3-p-menthandial; fatty oil (10 to 15%): main fatty acids petroselic acid, palmitic acid; proteic substances (15 to 20%).	26	1
46	*Ferula* sp.	RO	A rare and widely used traditional fragrant plant in Afghanistan contains EO.	27	

#	Scientific name	PU	Major compounds	FQ	Ref.
47	*Nigella sativa*	SE	The seeds contain about 20-40% fatty oil characterized by many unsaturated fatty acids; 0.4-1.5% EO with thymoquinone, p-cymene, carvacrol, trans-anethole, 4-terpineol, and longifolin Also, flavonoids (quercetin and campherol), steroid alkaloids, coumarins, saponins, and mineral salts.	27	2
48	*Curcuma longa*	RH	About 235 compounds, primarily phenolic compounds, and terpenoids have been identified, including 22 diarylheptanoids and diarylheptanoids, eight phenylpropene and other phenolic compounds, 68 monoterpenes, 109 sesquiterpenes, five diterpenes, three triterpenoids, four sterols, two alkaloids, and 14 other compounds (Li, et al., 2011).	27	*
49	*Daucus carota*	RO	Carotenoids: including α-, β-, γ - zeta-carotene, lycopene; EO (trace): p-cymene, limonene, dipenten, geraniol, alpha- and beta-caryophyllene; polyines: including falcarinol (carotatoxin); glucose, saccharose.	30	1
50	*Nepeta juncea*	HE	EO with monoterpenes (1.8-cineole, α-terpineol, α-citral and geraniol, etc.) and sesquiterpenes (β-farnesene, α-bisabolene, β-caryophyllene, and α-humulene, etc.); flavonoids (luteolin and apigenin in glucosidic form, etc.); phenolic acids and steroids have been reported in *Nepeta* spp.	30	2
51	*Rosa damascena*	FL	The main components of the EO are 2-phenyl ethanol (73%), citronellol (11%), geranial (6%), and nerol (2%); more than 300 other compounds occur in traces. Rosewater mainly contains geraniol (31%), citronellol (30%), 2-phenyl ethanol (24%), and nerol (16%). petals are colored by anthocyanins (cyanidins).	30	2
52	*Plantago lanceolata*	HE	Iridoid monoterpenes (2-3%): aucubin (rhinantin) and catalpol, asperuloside; mucilages: glucomannans, arabinogalactans, rhamnogalacturonan; flavonoids: apigenin, luteolin glycosides; caffeic acid esters: chlorogenic acid, neochlorogenic acid, acteoside (verbascoside); tannins; hydroxycoumarins (aesculetin); saponins (traces); silicic acid.	31	1
53	*Nepeta glutinosa*	HE	EO with monoterpenes; phenolic compounds, flavonoids, and steroids.	33	2

#	Scientific name	PU	Major compounds	FQ	Ref.
54	*Zea mays*	ST	EO (0.2%): carvacrol, alphaterpineol, menthol, thymol; flavonoids: including among others maysin, maysin-3'-etiiyl ether; bitter substances; saponins (2-3%); tannins: proanthocyanidins; sterols: β-sitosterol, ergosterol; alkaloids (0.05%) 6-methoxybenzoxazolinone; fatty oil (2%).	34	1
55	*Allium sativum*	BU	Cysteine sulphoxides, mainly alliin besides isoalliin and methiin (including their gamma-glutamyl conjugates). Bulbs that have been dried and then remoistened, ferment into alliaceous oils. These oils are oligosulphides, ajoens, and vinyl dithiins; fructosans (polysaccharides); saponins.	35	1
56	*Elaeagnus angustifolia*	FU	Fruits contain a lot of protein, also essential fatty acids, glucose and fructose, flavonoids, vitamins, potassium, and phosphorus.	36	2
57	*Plantago psyllium*	SE	Mucilages (10-12%): arabinoxylans; iridoids: aucubin (0.14%); pyridine alkaloids: boschniakines, including plantagonine, indicaine, indicainine; proteic substances; fatty oil.	36	1
58	*Fumaria officinalis*	HE	Dermal disorders (19), acne (13), sore throat (2), digestive disorders (10), appetizer (4), liver disorders (2), hepatitis (4), anti-icteric (3), hemorrhoid (2), amenorrhea, hypolipidemic (2), and blood purifier (4).	37	
59	*Zingiber officinale*	RH	Gingerols: [6]-gingerol, [8]-gingerol, [10]-gingerol; shogaols: chief components [6]-shogaol, [8] - shogaol, [10] - shogaol (artifacts formed during storage arising from the gingerols); gingerdiols; diarylheptanoids: gingerenone A and B; starch (50%).	37	1
60	*Matricaria recutita*	FL	EO (0.4-1.5%): α-bisabolol (levomenol), bisabolol oxide A & B, bisabololone oxide A, β-trans-farnesene, chamazulene, spathulenol; flavonoids: apigenin, luteolin, chrysoeriol glycosides, flavonol glycosides, aglycones including quercetin, isorhamnetin, patuletin, rutin, hyperoside; mucilages (10%, fructans) including rhamnogalacturonan.	38	1

#	Scientific name	PU	Major compounds	FQ	Ref.
61	*Punica granatum*	PE, BA	Tannins (25 to 28%; gallo tannins): punicalin (granatine D), punicalagin (granatine C), granatine A, granatine B. in stem and Root cortex: Tannins (20 to 25% gallo tannins): including punicalagin, punicacortein C, casuarin; piperidine alkaloids (0.4% to 0.8%): chief alkaloids isopelletierine, N-methylisopelletierine, seudopelletierine.	39	1
62	*Mentha piperita*	LE	EO: menthol (35-45%), menthone (15-20%), menthyl acetate (3-5%), neomenthol (2.5-3.5%), isomenthone (2-3%), menthofurane (2-7%), limonene, pulegone, α- and β-pinene, trans-sabinene hydrate; caffeic acid, rosmaric acid; flavonoids: apigenin, diosmetin and luteolin glycosides, free lipophile methoxylized flavone including among others, xanthomicrol, gardenine D.	40	1
63	*Salix alba*	BA	Glycosides and esters yielding salicylic acid (1.5-12%): salicin (0.1-2%), salicortin (0.01-11%), and salicin derivatives acylated to the glucose residue (up to 6%, fragilin, populin); Tannins (8-20%); flavonoids.	40	1
64	*Levisticum officinale*	RO	EO (0.35-1.7%); alkylphthalides: 3 butylphthalide, ligusticumlactone (E- and Z-butylidenphthalides), E- and Z ligustilide, α- and β-pinene, β-phellandrene, citronellal; hydroxycoumarins: umbelliferone; coumarin; furocoumarins: bergaptene, apterin; polyynes: falcarindiol (probably only in the fresh rhizome).	42	1
65	*Hymenocrater sessilifolius*	HE	Diterpenes: sessilifol A and B; flavonoids: cirsimaritin, gardenin C; β-sitosterol, saringosterol; β-sitosterol glucoside; ursolic acid, sucrose, and vanillic acid (Khan, et al., 2017).	43	*
66	*Borago officinalis*	FL	Pyrrolizidine alkaloids: supinin, lycopsamin, 7-acetyl-lycopsamin, intermedin, 7-acetyl-termedine, amabiline, thesinine; silicic acid; mucilages; tannins.	44	1
67	*Peganum harmala*	SE	All plant parts contain alkaloids and are poisonous (up to 3.3% in the roots). The seeds contain significant amounts of harmane (β-carboline) alkaloids (harmaline, harmine, and related compounds, and chinazoline alkaloids like vasicine, vasicinone, and others).	44	2

#	Scientific name	PU	Major compounds	FQ	Ref.
68	*Juglans regia*	LE	Tannins (galloylglucose, ellagitannins); naphthalene derivatives: the fresh leaves and the fruit peels contain 1, 4, 5- trihydroxynaphthalene-4-β-D-glucoside, which is transformed into juglone through drying. Juglone polymerizes readily into yellow or brown products; flavonoids: peroxide, quercitrin.	47	1
69	*Malva neglecta*	HE	Phenolic compounds such as hydrotyrosol, coumaroylhexoside, kaempferol-3-(p-coumaroyldiglucoside)-7-glucoside, quercetin-3-O-rutinoside, and epicatechin-3-O-(4-O-methyl)-gallate. Oleic acid (19.7%), taurine (17.6%), ethylene dimercaptan (14.7%), isoeugenol (14.6%), patchoulane (10.4%), methyl 12-methyltetradecanoate (8.5%) and isopropyl myristate (7.0%) (Saleem, et al., 2020).	47	*
70	*Ephedra gerardiana*	HE	Alkaloids of the 2-aminophenylpropane type: main alkaloids L-(-)-ephedrine (1R, 2S-(-) - ephedrine) and D-pseudoephedrine (1S, 2S-(+)-ephedrine); lesser alkaloids L-norephedrine, D-norpseudoephedrine.	49	1
71	*Artemisia sieberi*	HE	Camphor, 1.8-cineol, camphene, terpinen-4-ol; sesquiterpene mainly dehydro-1.8-sesquicineole.	52	1
72	*Urtica dioica*	HE	Histamine, serotonin, acetylcholine, formic acid; flavonoids (0.7-1.8%): including rutin, isoquercitrin (0.02%), astragalin, kaempferol-3-O-rutinoside; silicilic acid (1-4%); EO: ketones, 2-methylhept-2-en-6-on; potassium-ions (0.6% in the fresh foliage); nitrates (1.5 to 3%).	52	1
73	*Trachyspermum copticum*	SE	Up to 5% EO, mainly with thymol (39%), p-cymene (31%), γ-terpinene (23%), β-pinene (2%), and terpinene-4-ol (1%). The relative amounts show huge variations.	58	2
74	*Prunus cerasus*	FU, PE	Fruits contain sucrose, fruit acids; polyphenols including cyanidin derivatives (mainly cyanidin-3 glucosylrutinoside, cyanidin-3-rutinoside, cyanidin sophoroside), peonidin-3-glucoside; kaempferol, quercetin, and isorhamnetin; leave and fruit stalks contain amygdaline, cyanidin, and phenolic acids with methyl salicylate.	58	2

#	Scientific name	PU	Major compounds	FQ	Ref.
75	*Alhagi pseudalhagi*	HE, RO	Up to 5% EO, mainly with thymol (39%), p-cymene (31%), γ-terpinene (23%), β-pinene (2%), and terpinene-4-ol (1%). The relative amounts show huge variations.	61	2
76	*Anethum graveolens*	HE, SE	Herb contain EO (0.5 to 1.5%): carvone, dill apiole, (+) limonene; phthalides. Seeds contain EO (2.5 to 4.0%): carvone (ca. 50%), dill apiole, limonene; phthalides; FO; furocoumarins: bergaptene; hydroxycoumarins: umbelliferone.	63	1
77	*Artemisia alba*	FL	Sesquiterpenes such as 8-cedren-13-ol and α-bisabolol; monoterpenes such as santolinatriene; phenolic compounds like flavonoids.	63	2
78	*Mentha longifolia*	HE	EO: piperitone (60-80%), β- caryophyllene (5-15%), germacren D (5-15%), 1, 8-cineole (2- 7%, limonene (1-8%); D-carvone, piperitone, iso menthone, menthofurane, menthone, piperitol, menthol; flavonoids: diosmin, hesperidin, quercitrin, thymonin, and apigenin-7-glucuronide.	68	1
79	*Artemisia absinthium*	HE	EO: thujone, cis-epoxy ocimene, chrysanthenyl acetate; sesquiterpene bitter principles: including absinthine, anabsinthine, artabsine, and matricine.	70	1
80	*Glycyrrhiza glabra*	RO	Triterpenes saponins (3-15%): glycyrrhetinic acid, 18-α-glycyrrhetinic acid, glycyrrhetinic acid methyl ester, glabric acid, glabrolide, uralenic acid; flavonoids: liquiritigenin, isoliquiritigenin, isolicoflavonol, isoliquiritin, licoricidin-isoflavonoids: aglycones formononetin, glabren, glabridin, glabrol, 3-hydroxyglabrol, glycyrrhisoflavone; liquocoumarin; hydroxycoumarins: herniarin, umbelliferone, glycycoumarin, licopyranocoumarin; steroids: sterols, including β-sitosterol, and stigmasterol.	83	1
81	*Descurainia sophia*	SE	EO with cis-β-ocimene, menthol, isomenthyl acetate; trace amounts of esters, aldehydes, alcohols, phenols, and ketones. Glucosinolates: descurainolide A and B, descurainin, descurainin A, descurainoside A and B; cardenolides like strophanthidine, evomonoside, helveticoside, evobioside, and erysimoside.	86	2

#	Scientific name	PU	Major compounds	FQ	Ref.
82	*Berberis integerrima*	FU, RO	All plant parts, except the berries, contain poisonous alkaloids (berberine, berberal, berbamine, obaberine, and oxyacanthine). The sour berries contain fruit acids (malic acid etc.).	90	1
83	*Plantago major*	SE	Leaves with aucubin glycoside, phenolic acids, triterpenes, flavonoids, tannins, and mucilage. Seeds contain considerable amounts of mucilage.	94	2
84	*Althaea officinalis*	RO, LE	Mucilages: particularly galacturonic rhamnans, arabinogalactans, arabans, and glucans; pectins; starch.	95	1
85	*Foeniculum vulgare*	SE	Trans-anethole (80-90%), fenchone (1-10%); estragole (3-10%), α-pinenes, camphene, pcymene, myrcene, limonene, α- and β-phellandrene, γ-terpenes, terpinols, γ-fenchen.	99	1
86	*Achillea wilhelmsii*	HE	EO with 1, 8-cineole (46%) and camphor (17%); α-terpineol (8%), borneol (3%), sabinene (3%) and terpinen-4-ol (3%). glycosides, tannins, and bitterns. The methanolic extract of flowers contains ascaridole (43%) and isoascaridole (38%).	112	2
87	*Cichorium intybus*	RO	Sesquiterpenes: sesquiterpene lactones, especially lactucin, lactucopicrin, 8-deoxy lactucin; guaianolid glycosides (chicoroisides B and C, sonchuside C); caffeic acid derivatives: chiroric acid, chlorogenic acid, dicaffeoyl tartaric acid; hydroxycoumarins: umbelliferone; flavonoids: including hyperoside; polyynes.	155	1

Abbreviations: FQ, frequency; Ref., references; 1, (PDR, 2007); 2, (Keusgen, et al., 2020); *, other than 1 & 2 which are cited in the table accordingly

Among the top 87 plant species, 52 species (61%) are phytochemically and pharmacologically well studied, have monographs in the PDR (2007), and are used in modern medicine. To investigate whether the remaining plant species (39%), which have no monograph in PDR (PDR, 2007), have already been reported in the scientific literature or not, cross-referencing was performed by entering the botanical name into the database of Google Scholar. As a result, it was found that terpenoids, phenolic compounds, alkaloids, glycosides, and their derivatives are the main secondary metabolites of the above-mentioned plants which are responsible for their biological activities. These secondary metabolites are discussed here briefly.

4.1.1 Alkaloids

Alkaloids are organic bases that contain nitrogen in their structures and many of them have pronounced pharmacological activities. They occur in plant tissues as water-soluble salts of organic acids, esters, or in combination with tannins or sugars (glycoalkaloids) rather than as free bases. These compounds can be classified based on their structure, biological activity, the pathway of their biosynthesis, and occurrence (Badal & Delgoda, 2017). Most authors of pharmacognosy classified them into heterocyclic and non-heterocyclic groups. Heterocyclic alkaloids, which contain at least one nitrogen atom in their heterocyclic system, are further classified into several groups Figure 31.

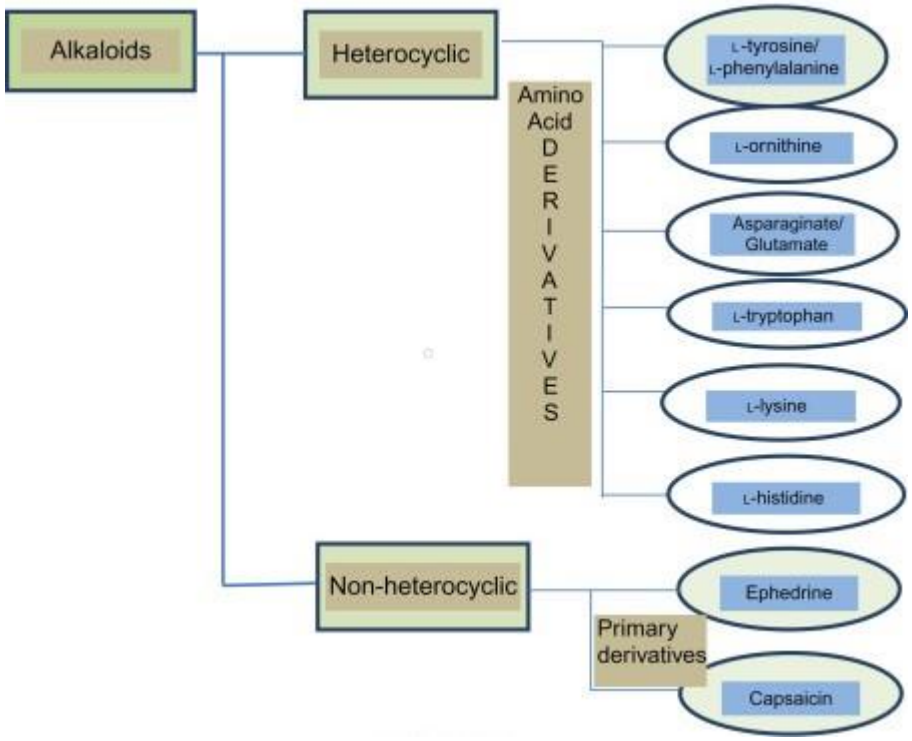


Figure 31 *Classification of Alkaloids (Badal & Delgoda, 2017).*

Non-heterocyclic alkaloids result from amino acids or biogenic amines and lack nitrogen in the heterocyclic ring. Ephedrine (in *Ephedra* spp.) and capsaicin (in *Capsicum annum*) are the chief members of this group. They are well-known and prescribed to patients. Mostly, alkaloids have a very bitter taste and are toxic. Therefore, plants containing these compounds are not eaten by animals and act as defenders against herbivores, microbial pathogens, and invertebrate pest attacks. The chemical structures of alkaloids are very diverse, which may be the reason that alkaloids own significant clinical use as medicines for the treatment of various diseases. They typically contain a nitrogen-containing heterocyclic ring (Figure 32). Even though the majority of the medicinal plants containing alkaloids are commonly used in traditional medicines, it should be considered that they are very strong in their effect, their therapeutic index is very thin, and toxicity may occur. Medicinal plants such as *Papaver somniferum* with isoquinoline alkaloids, *Solanum nigrum* with steroid alkaloids, *Convolvulus arvensis* with tropane and pyrrolidine alkaloids; *Trichodesma incanum,* and *Borago officinalis* with pyrrolizidine alkaloids, *Fumaria officinalis* with isoquinoline alkaloids, *Peganum harmala* (quinazoline alkaloids), *Ephedra* spp. with non-heterocyclic alkaloids, and *Berberis integerrima* (berberine) are the most commonly used plants containing alkaloids in our study area.

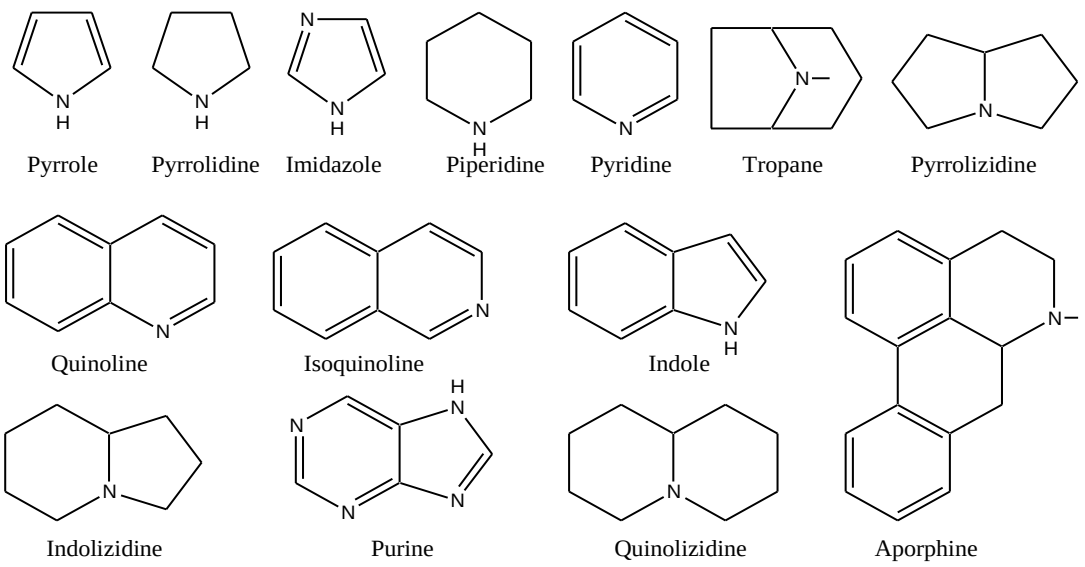


Figure 32 *Basic skeletal structures of alkaloids in natural products.*

4.1.2 Terpenoids

Terpenoids, which are also known as isoprenoids, are the most numerous and structurally diverse natural organic hydrocarbon products. They are classified based on the number of

isoprene units in their structure (Table 13). Terpenoids are most abundant, among plant secondary metabolites. They are commonly present in higher plants and are normally stored in vegetative tissues, flowers, and, rarely, roots. Their diverse biological activities bring people to use them as a wide resource. They offer new prospects to identify new drugs with minimum side effects (Badal & Delgoda, 2017). Among terpenoids, monoterpenes and sesquiterpenes are usually the constituents of EOs that have economic significance as flavors and perfumes. These are also commonly used as natural flavoring compounds in food industries.

Table 13 *The classification of terpenoids.*

Name	**No. of Isoprene Units**	**No. of Carbon Atoms**	**General Formula**
Hemiterpenoids	1	5	C_5H_8
Monoterpenoids	2	10	$C_{10}H_{16}$
Sesquiterpenoids	3	15	$C_{15}H_{24}$
Diterpenoids	4	20	$C_{20}H_{32}$
Sesterterpenoids	5	25	$C_{25}H_{40}$
Triterpenoids	6	30	$C_{30}H_{48}$
Tetraterpenoids (carotenoids)	8	40	$C_{40}H_{64}$
Polyterpenoids	>8	>40	$(C_5H_8)_n$

4.1.2 Essential oils

Essential oils (EOs) are mixtures of volatile, lipophilic compounds with a characteristic taste and odor. They are unstable and sensitive to exposure to air, light, and heat. Therefore, plants containing EOs have to be stored in dark and airtight containers. The effects of EOs depend on their chemical composition and generally, most of them have antibacterial and antifungal effects (Keusgen, et al., 2020).

Foeniculum vulgare, *Cuminum cyminum*, *Coriandrum sativum*, *Trachyspermum ammi*, *Carum carvi*, *Anethum graveolens*, *Ferula* spp., *Prangos pubularia*, *Acorus calamus*, *Achillea wilhelmsii*, *Artemisia sieberi*, *Mentha piperita*, *M. longifolia*, *Matricaria chamomilla*, *Ocimum basilicum*, *Nepeta* spp. and *Marrubium anisodon*, which are mainly used in the treatment of GI disorders such as stomachache, flatulence, colics, and diarrhea as well as for respiratory system ailments like bronchitis, sore throat, and cough, are the most commonly used plants with EO in the traditional medicine of Kabul and Parwan provinces.

Monoterpenes, the main constituents of EO have several effects including antimicrobial, anti-inflammatory, analgesic, hypotensive, and antipruritic. Adriana, et al., (2013) reported that monoterpenes exhibited antinociceptive and anti-inflammatory activities in animal models. The anti-inflammatory effect of monoterpenes is attributed to the inhibition of COX activity. The chemical structures of a few typical monoterpenoids are shown in Figure 33.

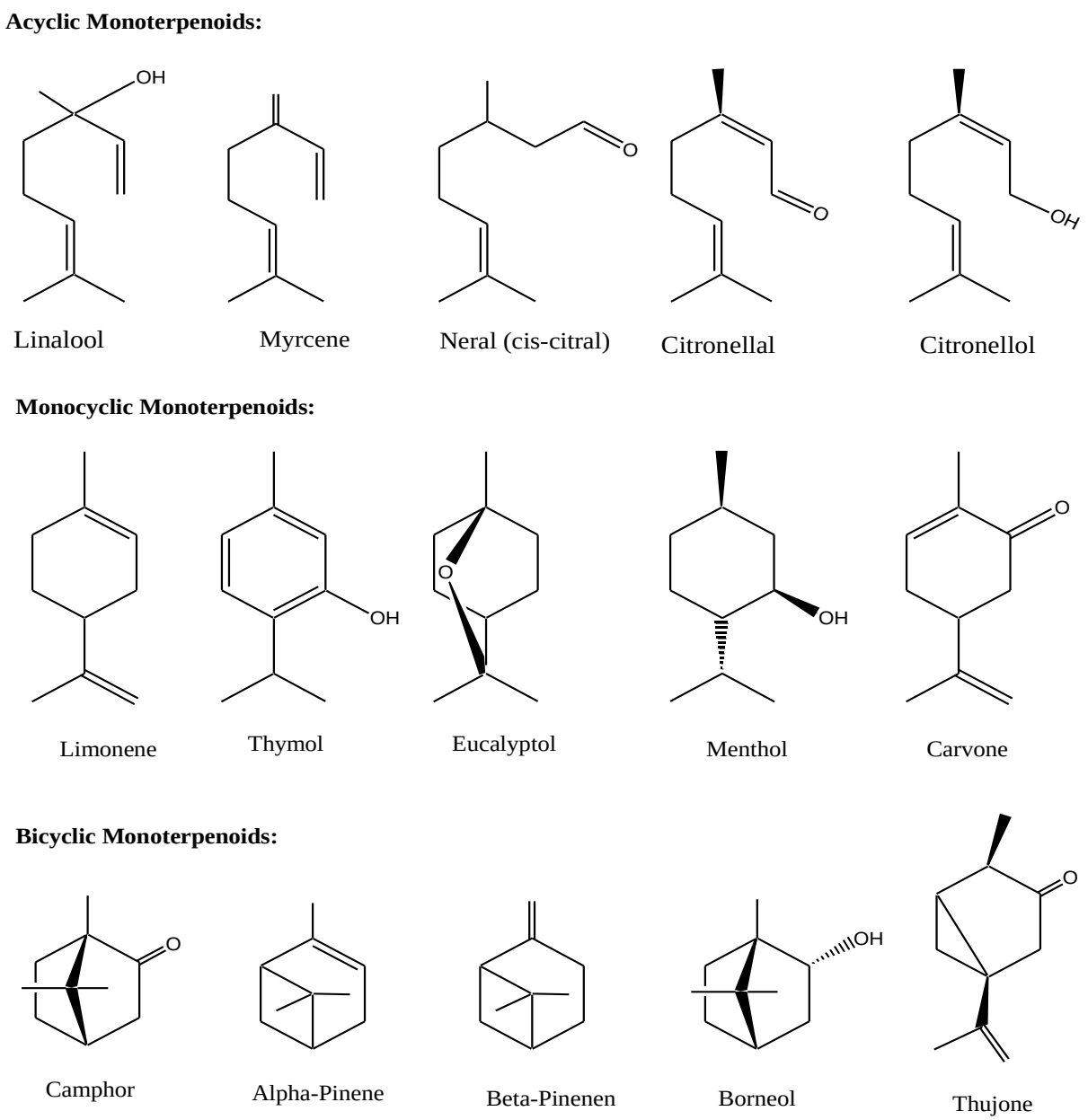
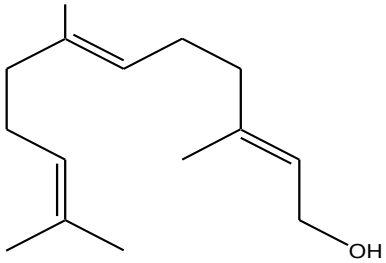


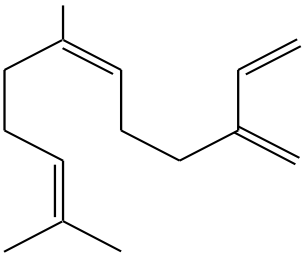
Figure 33 *Chemical structures of some important monoterpenoids.*

Sesquiterpenes are also important components of EOs, widely distributed in the plant kingdom, and have a wide variety of structures including acyclic, bicyclic, tricyclic, tetracyclic, and macrocyclic frameworks. Some typical structures of these compounds are shown in Figure 34.

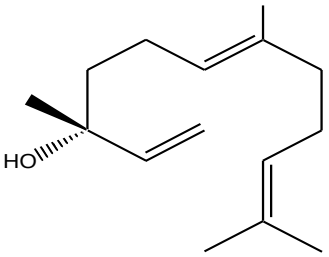
Acyclic Sesquiterpenoids:



Farnesol

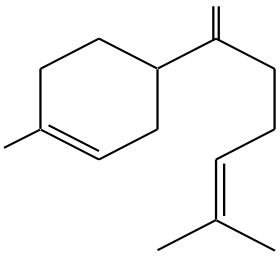


Farenesene

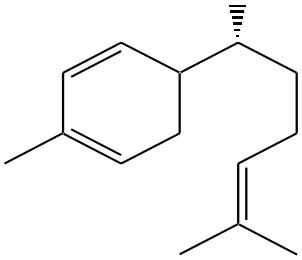


Bita-Nerolidol

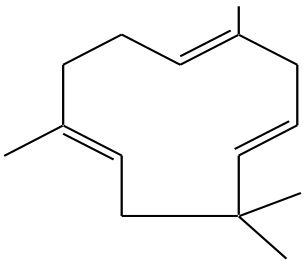
Monocyclic Sesquiterpenoids:



Bita-Bisabolene

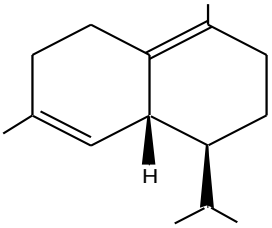


Alpha-Zingiberene

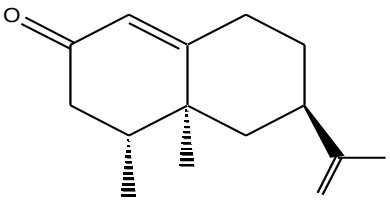


Alpha-Humulene

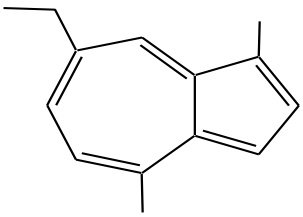
Bicyclic Sesquiterpenoids:



Cadinene

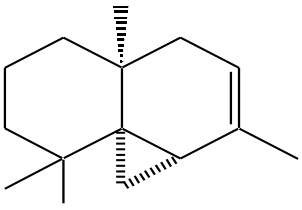


Nootkatone

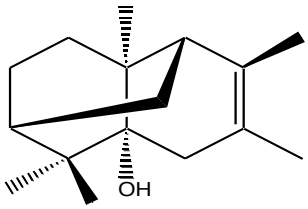


Chamazulene

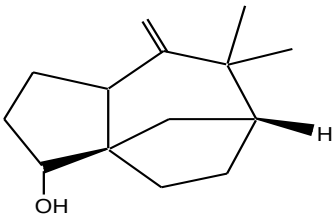
Trycyclic Sesquiterpenoids:



Thujopsene



Patchoulol



Khushimol

Figure 34 *The chemical structures of typical sesquiterpenoids.*

These compounds are known to have various biological activities. For example, in vitro anti-inflammatory activity in cellular systems generating cyclooxygenase (COX) and 5-lipoxygenase (5-LOX) metabolites of these compounds have been evaluated. They showed a significant effect on thromboxane B2 (TXB2)-release induced by calcium ionophore in human platelets, although with less potency than the reference drug ibuprofen (Villaescusa, et al.,

1996). Besides, Bermejo et al. (2002) reported that sesquiterpenes, such as leucine, glutinone, epi-kutdtriol, and kutdtriol, have anti-inflammatory properties.

4.1.3 Tannins

Tannins are a group of plant secondary metabolites that can tan or convert animal skin into leather. These compounds are classified as water-soluble phenolics with relative molar masses between 300 and 3000, and with the ability to precipitate alkaloids, gelatins, and other proteins. According to recently published data, tannins are classified according to their structural characteristics into four major groups, namely gallotannins, ellagitannins, complex tannins, and condensed tannins (Figure 35).

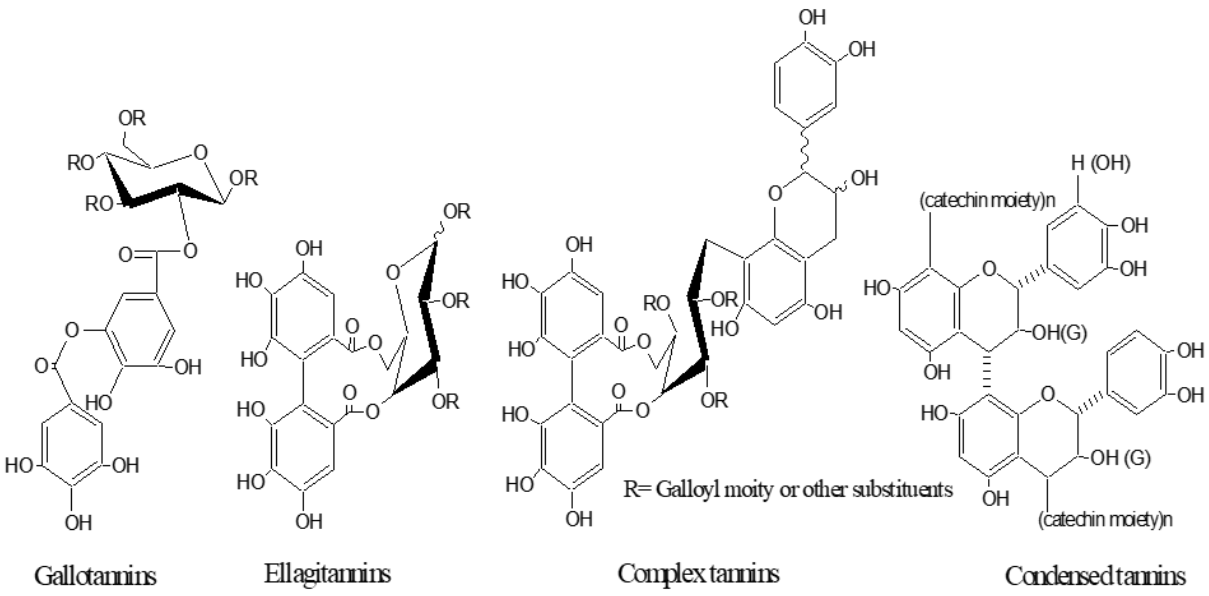


Figure 35 *Basic chemical structures of tannins.*

Different bioactivity of tannins including antioxidant and antimicrobial properties was reported. They inhibit lipid peroxidation and scavenge the free radicals that are important in cellular prooxidant states. Tannins appear to affect bacterial growth via several indirect mechanisms. They inhibit extracellular microbial enzymes, as well as the deprivation of the substrates required for microbial growth. They also can directly affect microbial metabolism via the inhibition of oxidative phosphorylation. Other biological activities such as cardioprotective, histamine release inhibition, and cytotoxic activity are also reported. These substances are useful in the external treatment of dermal inflammation and wounds, and the intake of tannins may prevent the onset of chronic diseases (Badal & Delgoda, 2017). Typical plants containing tannins in our study area are *Punica granatum*, *Juglans regia*, *Ephedra gerardiana*, *Salix* spp., *Elaeagnus angustifolia*, *Rumex crispus,* and *Mangifera indica*. The fruit

peel of *Punica granatum*, which is used in powder form, as well as a decoction for the treatment of diarrhea and dysentery, has been reported to contain 25 – 28% gallo tannins including granatine A, B, C, and D. *Juglans regia* seeds, fruit septa, fruit shell, and leaves are used for different medicinal purposes. For example, seeds as an anti-hyperlipidemic, nerve tonic, and blood purifier, seeds septa against kidney disorders, and fruit shells and leaves as a hair tonic as well as the treatment of leishmaniasis. Literature reveals that fruit shells and leaflets contain tannins (galloylglucose and ellagitannins), naphthalene derivatives which are transformed into juglone, and flavonoids such as hyperoside and quercitrin (PDR, 2007). *Ephedra* herb which is used in GI, respiratory, and CVS disorders as well as for the tanning of animal dermis, has been reported to contain approximately 20% polyphenolic compounds (Saida & Emin, 2015). *Salix* spp. leaves and rootlets are used as an analgesic and antipyretic in the study area, have been reported to contain 8 – 20% tannins in addition to the glycosides and flavonoids content. *Elaeagnus angustifolia* fruit and leaves are traditionally used in this study mainly against diarrhea and hyperlipidemia, respectively. It has been reported that the ethanolic and methanolic extracts of leaves contain 8 – 10% of phenolics Saboonchian, et al. (2014). *Rumex crispus,* which is used as a laxative, emollient, anti-inflammatory, wound healing, and for dermal rashes in this study, contains 3 – 6% of tannins (PDR, 2007).

4.1.4 Glycosides

Glycosides chemically consist of two functionally independent parts; the aglycone (genin) and the glycone (saccharide) parts. The therapeutic activity of glycosides depends on their aglycone portion, while the sugar part affects the water solubility, kinetics, and pharmacodynamic properties of the whole molecule. The glycosidic linkage (β-linked) is resistant to human gastrointestinal enzymes and is poorly absorbed from the digestive tract. They usually travel to the distal ileum, and their microbial activity splits off the aglycone, which is less polar and can be absorbed into the bloodstream. Also, entire glycosides like flavone glycosides can be resorbed, too, by sugar carriers. Glycosides are mainly classified into phenolic glycosides, coumarin glycosides, chromone glycosides, flavonoid glycosides, anthraquinone glycosides, saponosides, cardiac glycosides, cyanogenic glycosides, and thioglycosides. Among the above-mentioned classes of glycosides, cardiac glycosides, saponosides, flavonoids, and anthracinosides are of high therapeutic significance, which is briefly discussed in the following paragraphs.

4.1.5 Cardiac glycosides

These glycosides contain a steroid aglycone (Figure 36) and have been used for the treatment of heart problems for many decades. However, the therapeutic index of these compounds is very narrow, and therefore only isolated pure compounds are allowed to be used in modern medicine. Even though some plant species with cardiotonic glycosides such as *Adonis* spp., *Nerium oleander*, and *Convallaria* spp. are found in Afghanistan, it looks like they are not recognized among the inhabitants of our study. Only *Nerium oleander* and *Digitalis purpurea* have been cited by one informant each. Plants containing cardiotonic glycosides are poisonous and considered to be toxic. Therefore, traditional use is not recommended (Keusgen, et al., 2020).

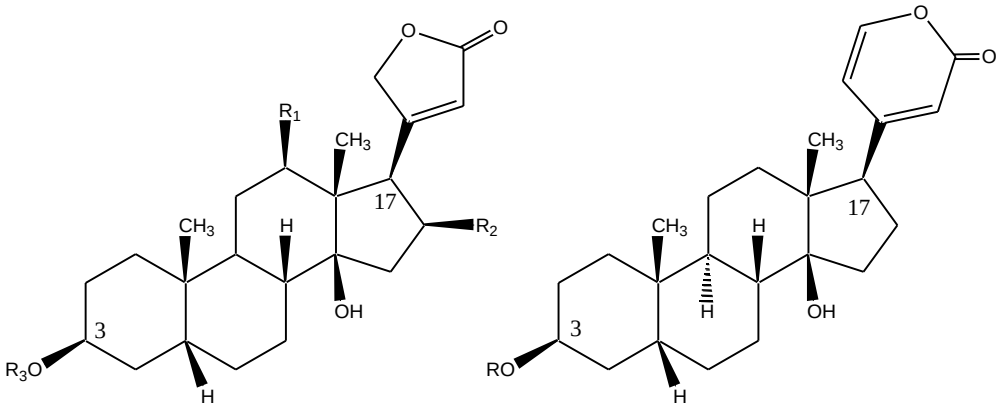


Figure 36 *Cardiotonic glycosides backbones.*

4.1.6 Saponosides

Saponosides or saponins are secondary metabolites that contain triterpene or steroidal structural aglycone. Steroid saponins are less widely distributed in nature and more common among the monocotyledon families, especially Dioscoreaceae (like *Dioscorea* species), the Agavaceae (like *Agave*, *Yucca*), Smilacaceae (like *Smilax*), and Melanthiaceae (like *Trillium*), while triterpene saponins are widely distributed among the higher plants (Figure 37). Saponins alter the permeability of all biological membranes and have a wide variety of medicinal effects. Many of these compounds act as an expectorant and their expectorant effect is thought to be mediated by the gastric mucosa, which reflexly stimulates mucous glands in the bronchi via parasympathetic pathways. So they can liquefy viscous mucus and improve the bronchial secretion of less viscous mucus. Some of them have a diuretic action (like *Allium* spp.), and a number of them are vasoprotective, anti-edema, anti-inflammatory, antithrombotic, and anti-

hemorrhoids (e.g. *Aesculus hippocastanum* L.), hypoglycemic, and hypocholesterolemic (like *Trigonella foenum-graecum*). Plants containing saponins have been shown to inhibit cholesterol absorption from the intestinal lumen and consequently reduce the concentration of plasma cholesterol. This may be the result of interactions with cholesterol in the digestive tract or a direct effect of plant saponins on cholesterol metabolism. For example, saponin fractions from garlic or ginseng were shown to decrease total and LDL cholesterol plasma concentrations without changing HDL cholesterol levels in hypercholesterolemia animal models (Keusgen, et al., 2020; Badal & Delgoda, 2017; Schulz, et al., 2001).

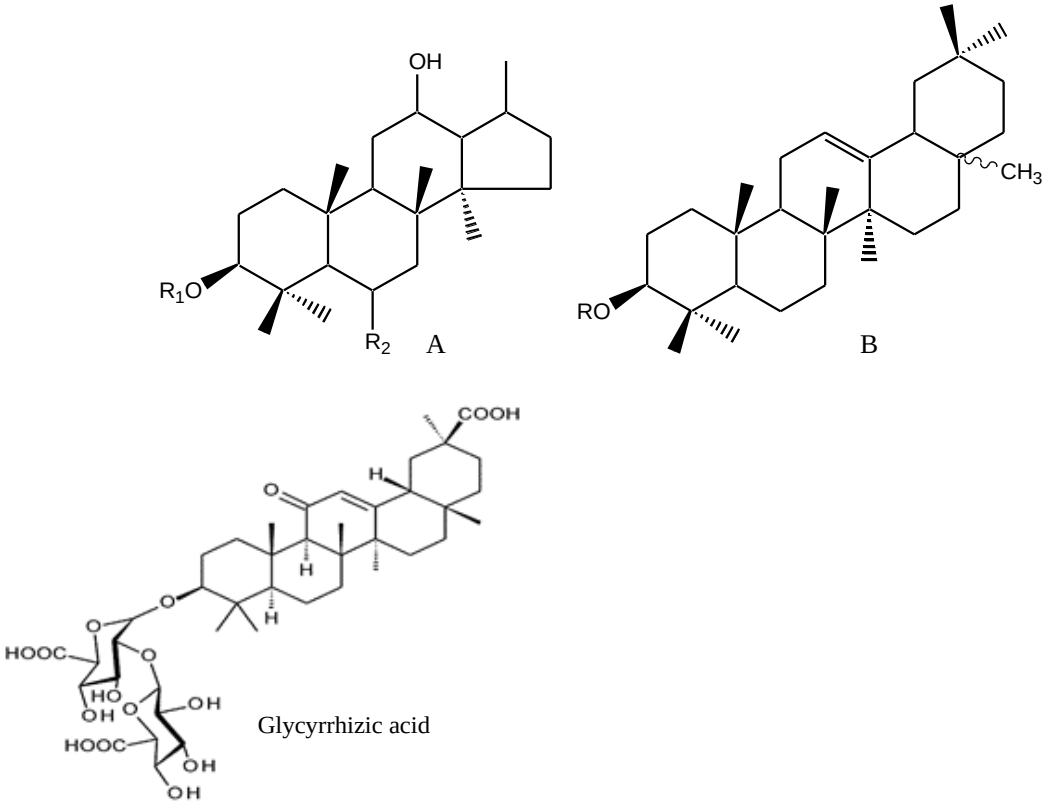


Figure 37 *Structural types of saponosides aglycones: A, steroid; B, triterpene; glycyrrhizic acid.*

The saponin-containing plants that are most commonly used in this study are *Glycyrrhiza glabra*, *Trigonella foenum-graecum*, (Fabaceae), *Tribulus terrestris* (Zygophyllaceae), *Saponaria griffithiana* (Caryophyllaceae), and *Asparagus officinalis* (Asparagaceae).

In this study, *Glycyrrhiza glabra* which is mainly used in the treatment of gastrointestinal disorders, as well as for respiratory disorders, contains up to 23% of saponins. Glycyrrhizic acid (Figure 37) and 18-β-glycyrrhetinic acid are marker saponins, and anti-inflammatory,

anticancer, antibacterial, antiviral, antifungal, and hepatoprotective medicinal effects have been reported in the literature (Keusgen, et al., 2020).

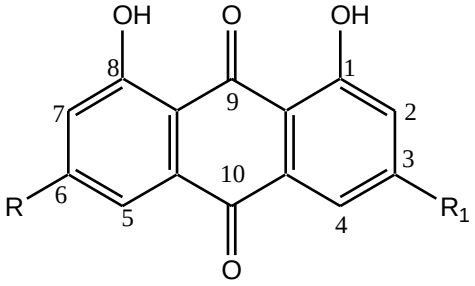
Trigonella foenum-graecum is an annual plant, which is widely used as a spice in the northern parts of Kabul. Its seeds contain 1-2% of saponin including trigofoenosides A to G and sapogenins, principally diosgenin and yamogenin. Due to its easy cultivation and rapid growth, it features an important source of steroid production (Dewick, 2001). The anti-hyperglycaemic effect of its seeds has been verified in experimentally induced diabetic animals and human volunteers. In clinical studies, the administration of the plant seed powder (50 g two times a day with meals) in type 1 diabetic patients for 10 days lowered fasting blood sugar and reduced hyperlipidemia significantly (Gurib-Fakim, 2006). However, the mode of action is unclear. It was proven for the treatment of loss of appetite and inflammation of the skin (PDR, 2007).

Tribulus terrestris, which has traditionally been used in our study area mainly for urinary tract disorders such as kidney and bladder stones, cystitis, gonorrhea, as well as aphrodisiac, has been reported to have furastanol bis glycoside, diosgenin, ruscogenin, and gitogenin of the steroid saponins. The diuretic and aphrodisiac effects of the latter are known (Qadry, 2009). *Saponaria griffithiana* is native to the mountainous area of the Parwan province, and its roots are used by local people as a detergent for washing clothes and heads. Its sister species *Saponaria officinalis* L. is reported to have triterpene saponins (2 to 8%) with aglycones quillaic acid and gypsogenic acid. In addition to the mentioned plants, *Asparagus officinalis* herb, which is traditionally used against kidney and bladder stones, as a diuretic, for cardiovascular disorders, rheumatism, and gout as well as for liver and GI disorders, has been reported to contain flavonoids including rutin, hyperoside, and isoquercitrin as well as steroid saponins. It was approved by Commission E for UTI as well as kidney and bladder stones. In homeopathy medicine, it is used for kidney stones and cardiac insufficiency (PDR, 2007).

4.1.7 Anthraquinone glycosides

Plants containing anthraquinone glycosides like rhubarb, *Senna*, and *Cascara* have strong laxative effects and therefore, have been used since ancient times. The anthraquinone structure is based on anthracene, where three benzene rings are joined together (Figure 38). Anthrones are not stable, so in plant drugs, anthraquinones are only found as free aglycones. Anthrones and anthraquinones are mainly occurring as O-glycosides or rarely as C-glycosides. These compounds are easily oxidized leading to the formation of dianthrones. These oxidized forms usually have a milder effect. Some compounds of this group can cause stomach irritation.

From the pharmacological point of view, anthraquinone glycosides are inert and enter the colon unchanged. There they are degraded by intestinal bacteria and free anthrones are produced, which are considered the active principles. These metabolites directly act on the intestinal mucosa and induce an unphysiological bowel movement with loose stools and frequent griping.



Anthraquinone Aglycones

Chrysophanol	R = H	$R_1 = CH_3$
Aloe- emodin	R = H	$R_1 = CH_2$-OH
Rhein	R = H	R_1 = COOH
Emodin	R = OH	$R_1 = CH_3$
Physcion	R = OCH_3	$R_1 = CH_3$

Figure 38 *Chemical structures of anthraquinone glycosides.*

Typical plants containing these substances and used in the Kabul and Parwan traditional medicine are *Rheum ribes*, *Senna alexandrina*, and *Cassia fistula*. The first mentioned species is native to the mountainous regions of Kabul and Parwan provinces but the two others are imported drugs mostly from India and Pakistan. The phytochemistry of underground parts of the *Rheum* is well known; they contain approximately 2.5% anthranoids, mostly consisting of anthraquinone glycosides (60-80%), anthrone glycosides (10-25%), and free anthraquinones (about 1%). Also, tannins (about 5%), flavonoids, pectins, and minerals are present. However, in Afghanistan, people commonly use the flowering stalk and leaf petioles as a vegetable as well as for dishes. In contrast, the underground parts are only administered by traditional healers. Senna leaves and pods as well as *Cassia fistula* are well-known imported drugs in Afghanistan and have been used all around the country since ancient times. The former species is an official drug and monographed in most pharmacopoeias. It contains 3.5-5.5% anthranoids, principally sennosides A and B. Its leaves are used in the form of teas, but extracts are widely used in the combination of different laxative products. *Cassia fistula* mesocarp contains anthracene derivatives (1%) including sennosides and fistulinic acid. It has a laxative effect. Besides antimicrobial also antiviral effects of its fruit preparations are reported in the literature. In Indian medicine, it is used for flatulence, constipation, fever, anorexia, gout, jaundice, itching, and skin conditions, but, except for constipation, these uses are not proven. In Afghanistan traditional and folk medicine, it is commonly used in paediatrics. However, official agencies, such as PDR, contraindicated it for children under 12 years of age, pregnant and nursing women as well as for a patient with ileum, acute-inflammatory diseases of the intestine, and appendicitis (PDR, 2007).

4.1.8 Flavonoids

Flavonoids are polyphenol compounds comprised of C6-C3-C6 structures forming a 2-phenyl-benzo-γ-pyrane (chromane) nucleus consisting of two benzene rings linked through a heterocyclic pyrane ring (Figure 39).

Plants containing flavonoids as well as pure compounds has been reported to have anti-inflammatory, diuretic, spasmolytic, hypotensive, antirheumatic, diaphoretic, antipyretic, antidiabetic, vasoprotective hemostatic, antihaemorrhoid, antioxidant, antibacterial, antifungal, anthelminthic, cytotoxicity, antinociceptive, estrogenicity, antifertility, anti-adipogenicity, cardiotonic, hypotonic, cholagogue, hepatoprotection, anti-histamine, anxiolytic, hypoglycemic, anti-tumor (against colon, breast and bone cancers), as well as choleretic and estrogenic activities (Badal & Delgoda, 2017; Rubio, et al., 1995). Pure flavonoid compounds, for instance, kaempferol shows protective effects against endothelial damage and its mechanism may be associated with an improvement in nitric oxide production and a decrease in asymmetric dimethylarginine levels (Xiao, et al., 2009). The most important plants with flavonoids in this study are *Crataegus songarica*, *Vitis vinifera*, *Ziziphus jujuba*, *Equisetum arvense*, and *Urtica dioica*.

It has been reported that *Crataegus songarica* contains flavonoids (1.8%): O-glycosides, including hyperoside (0.28%), rutin (0.17%), 6-C- and 8-C-glycosyl compounds, including vitexin (0.02%), vicenin-1, and orientin. Also, the plant contains oligomeric proanthocyanidins (2.4%), biogenic amines, including tyramine, and triterpenes (0.6%): including oleanolic acid, ursolic acid, and crataegolic acid. Hawthorn (but not this species) is approved by Commission E for the treatment of a decrease in cardiac output (Stage II). It is used for senile heart, chronic cor pulmonale, and mild forms of arrhythmias (PDR, 2007). The hydro extract of raisin (fruits of Vitis vinifera), which is traditionally used for the treatment of cardiovascular disorders and anemia, and as a general tonic, has been reported to have flavonoids (4-5%), including kaempferol-3-O-glucosides, and quercetin-3-O-glucosides. Its antiatherosclerotic, antitumor, hepatoprotective, ischemia prevention, and vascular protective effects are reported in the literature. In clinical trials, seed extracts were evaluated for the treatment of venous insufficiency. The results of the study displayed an improvement in the symptoms of venous insufficiency such as nocturnal cramps, paresthesias, and the sensation of warmth, cyanosis, and edema. Also, the effect of procyanidolic oligomers isolated from grape seed extract demonstrated protective effects on postoperative edema when compared with a placebo in a double-blind study (PDR, 2007).

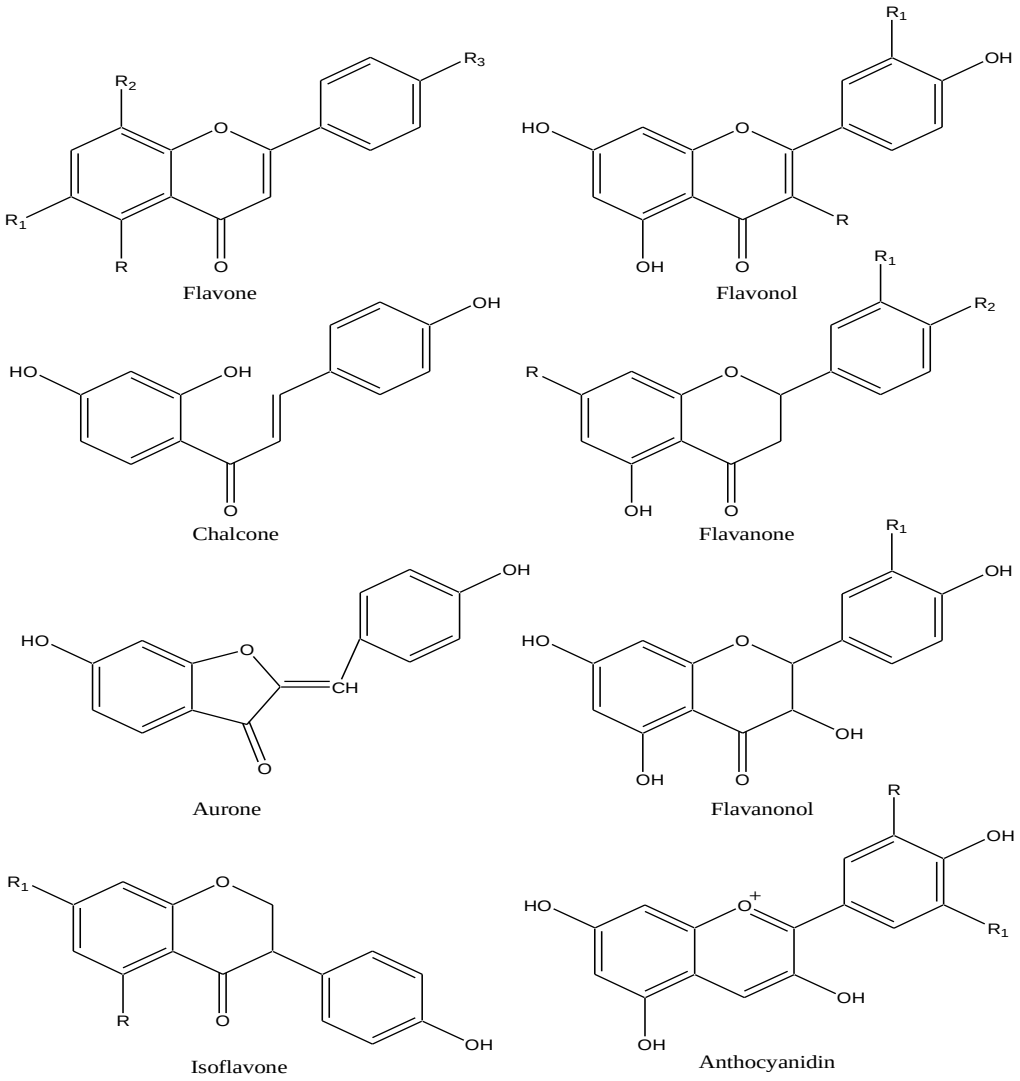


Figure 39 *Structural diversity of flavonoids.*

The fruit of *Ziziphus jujuba* is traditionally used as a sedative, antianxiety, and for restlessness, and is reported to have flavonoids including quercitrin, rutin, kaempferol, and the isoflavone puerarin. Moreover, it contains several minerals, vitamins, and triterpenoids. Its seeds also contain phenyl glycosides and alkaloids. *Equisetum arvense* has traditionally mainly been used for the treatment of urinary tract disorders such as kidney and bladder stones, nephritis, cystitis, urinary incontinence, gonorrhea, and prostatitis in our study area. It has been reported to have flavonoids (0.5-1%) including apigenin, genkwanin, kaempferol, luteolin, and quercetin in glycosidic forms. Further on, the plant contains caffeic acid ester (up to 1%), silicic acid (5 to 7.7%), and pyridine alkaloids. Literature reveals that horsetail has mild diuretic and spasmolytic effects. Flavonoids and silicic acid contribute to the astringent effect. It is approved by Commission E for the treatment of infections of the urinary tract, kidney, and bladder stones as well as wounds and burns (PDR, 2007). *Urtica dioica* aerial parts have traditionally been

used for the treatment of urinary disorders like gonorrhea, kidney & bladder stones, dysuria, diuretic, prostatic hyperplasia, arthritis, rheumatism, hypertension, hemorrhoid, flatulence, and diarrhea. It has been reported to have flavonoids (0.7-1.8%) including rutin, isoquercitrin, astragalin, and kaempferol-3-O-rutinoside. Further on, the plant contains silicic acid (1-4%), histamine, serotonin, acetylcholine, formic acid, leukotriens (LTB4, LTC4, and LTD4), volatile oil, and minerals including potassium (0.6%) and nitrates (up to 3%). Literature reveals that plant-pressed juice has a diuretic effect. Also, a local anesthetic and analgesic effect has been observed in animal tests. In addition, anti-inflammatory, antirheumatic and anti-arthritic effects have been reported (PDR, 2007).

4.2 Traditional applications in comparison to rational phytotherapy

The application of medicinal plants against diseases signifies a key success in the history of human beings. Archeologists demonstrated that human has used medicinal plants for at least 60, 000 years. These applications are powerfully developed over time by trial and error and results from these experiences established medicinal systems. Traditional phytomedicine are complex multicomponent mixtures and their usage is based on empirical experiences. Traditional phytomedicine generally has not been evaluated in controlled clinical trials or rigorous biomedical studies. In contrast, rational phytotherapy is a science-based application of medicinal plants or herbal remedies that started in the 19th century with the detection and separation of chemical bioactive markers, thus it distinguishes it from traditional approaches, which rely on an empirical appreciation of medicinal plants and which often linked to traditional knowledge. Now, rational phytotherapy requires that the particular medicinal plant must be correctly applied according to their science-based knowledge, in the proper dosage, and after consideration of the risk-benefit profile (Fürst & Zündorf, 2015).

The purpose of this chapter is to evaluate our informants' knowledge regarding the claimed medicinal properties of medicinal plants used in the study area with that of scientific reports to carry out a pharmacological validation for the claimed reported uses. For a better understanding, we have briefly compared the traditional application of the top 85 very frequently used medicinal plants in our study area with the scientific rationale for phytotherapy usage in Table 14. Medicinal plant species are ordered based on the increase in frequency. The data regarding the rational uses of these medicinal plants are mostly summarized by an official agency (PDR, 2007) as well as a recent medicinal plant handbook (Keusgen, et al., 2020).

Table 14 Traditional use of top 87 very frequently used medicinal plants of our study area versus rational use.

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Agropyron repens	The antimicrobial effect is approved for infections of the urinary tract and kidney and bladder stones.	Against kidney and bladder stones (5), Kidney pain (5), nephritis (1), gallstone (1), gonorrhea (1), prostatitis (1), kidney problems (1), hepatitis (1), antidiabetic (1), and antihypertensive (1).		
Ziziphus jujuba	Anticancer, anti-inflammatory, antifungal, antiobesity, immunostimulating, antiulcer, antibacterial, antioxidant, gastrointestinal protective, hepatoprotective, hypotensive, cardiotonic, antispasmodic, anti-fertility, neuroprotective, and antinephritic.	Antiatherosclerotic (1), antihypertensive (2), cardiotonic (1), hypolipidemic (3), blood purifier (2), antidiabetic (2), sedative (4), anti-anxiety (1), restlessness (1), bronchitis (4), dental care (1), and for digestive disorders (1).	11	2
Solanum nigrum	The local anesthetic effects, hypnotic effects, and antiulcer effects have been reported. The effect is attributed to the inhibition of pepsin and hydrochloric acid secretion.	Stomachache (3), constipation (1), antidiarrhoeal (1), gastritis (1), antipyretic (3), antirheumatic (1), urticaria (1), sore throat (1), nephritis (1), and wound healing (1).	11	1
Curcuma zedoaria	Antihepatotoxic, antitumor, antioxidative, hypolipidemic, antimicrobial, antifertility, anti-inflammatory, insect repellent, and inhibits prostaglandin formation. Used for dyspeptic complaints, and loss of appetite.	Stomachache (3), flatulence (1), constipation (1), appetizer (1), hemorrhoid (1), antirheumatic (1), heatstroke (2), sore throat (1), amenorrhea (2), foot, and hand pain (1).	11	1
Convolvulus arvensis	Hypotensive, anti-inflammatory, styptic, and antispasmodic.	Antihypertensive (6), hypolipidemic (2), for constipation (1), peptic ulcer (1), antirheumatic, urinary disorders (4), and anti-inflammatory agent (2).	12	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Polygonum bucharicum	Only traditional use: wounds, allergic rashes, skin infections, inflammation, diarrhea, bleeding piles, and hemorrhoids bleeding (Egamberdieva, et al., 2013).	Analgesic (1), antihypertensive (3), antidiarrhoeal (3), peptic ulcer (2), antiemetic (1), digestive (1), gingivitis (1), and stomatitis (3).	12	*
Portulaca oleracea	Neuroprotective, antimicrobial, antidiabetic, antioxidant, anti-inflammatory, anti-ulcerogenic, and anticancer activities have been reported in the literature.	For constipation (3), anemia (2), anorexia (1), margin (1), vertigo (2), and typhoid (1). Diuretic (1), anti-icteric (1), antimalarial (1), anti-inflammatory (1), taeniacid (1), antidiabetic (1), general tonic (1), for heatstroke (1), memory enhancement (1), nervous problems (1), liver diseases (1), toothache (1), sure throat (1), and kidney problems (2).	12	2
Malus domestica	Pectin is a swelling agent. Apple pectins have a mild binding effect. Unproven uses: antidyspeptic, diarrhea, and digestive complaints, especially in children.	Herpes simplex (2), cardiotonic (4), anti-arthritic (2), antirheumatic (3), antigout (2), anti-obesity (2), blood purifier (2) lung diseases (2), diuretic (1), kidney disorders (2), antidyspeptic (1), antiatherosclerotic (3), anemia (2), general tonic (2) and anthelmintic (1).	12	1
Mangifera indica	Antibacterial activity against various pathogenic bacteria (Amgad, et al., 2012).	Antidiarrhoeal (9), antidysenteric (2), and male sexual desire enhancement (1).	13	*
Terminalia chebula	Astringent, antibacterial, antiatherosclerotic, and cardiotonic.	Gastrointestinal disorders (12), gluttony (1), headache (1), amenorrhea (1), dental tonic (1), keeping hair black (3), liver disease (1), blood purifier (3), eye tonic (1), and brain tonic (1).	13	1
Astragalus benzudensis	No bibliography is available for this plant.	Digestive disorders (3), headache (1), kidney stones (5), kidney pain (4), nephritis (6), gonorrhea (2), bone fracture (1), and wound healing (1).	13	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Cassia fistula	The anthracene derivatives have a laxative effect. Preparations from the fruit have demonstrated antimicrobial and antiviral effects in vitro.	Stomachache (4), constipation (8), flatulence (2), antihypertensive (1), antidiabetic (1), anti-icteric (1), aphthous stomatitis (2), and abdominal pain (2).	13	1
Marrubium anisodon	Antinociceptive, antispasmodic, antioxidant, anticancer, antihypertensive, gastroprotective, antimicrobial, anti-inflammatory, and antihepatotoxic.	Anti-inflammatory (6), wound healing (3), for stomatitis (2), gingivitis (1), bladder stones (1), dermatitis (1), and headaches (1). Emmenagogue (1), and antiemetic (1).	13	2
Crataegus songarica	Used for senile heart, chronic cor pulmonale, and mild forms of bradycardial arrhythmias.	Heart diseases (4), antihypertensive (3), digestive disorders (6), hypolipidemic (4), nervous tonic (1), leishmaniasis (1), antipyretic (1), antidiabetic (1), anti-icteric (1), and sore throat (1).	13	1
Prunus persica	Anti-oxidant, antimicrobial (Belhadj, et al., 2016). Persicaside alkaloid inhibited nitric oxide (NO) and prostaglandin E2 (PGE2) production via suppression of inducible nitric oxide synthase (iNOS) and cyclooxygenase-2 expression in rat osteoblast sarcoma cells in a concentration-dependent manner whereas it spares the COX-1 activity (Rho, et al., 2007).	Aphthous ulcer in livestock (4), infectious wounds healing in livestock (1), disinfectant (1), anthelmintic (1), hemorrhoid (1), anti-arthritic (1), and backache (1).	13	*
Trichodesma incanum	Internal use is not recommended. It is also toxic for animals. For skin diseases; it exhibited anti-inflammatory and analgesic properties.	Wound healing (6), anti-inflammatory (1), acne (2), furuncle (2), dermal rashes (1), body abscess (1), heatstroke (1), bruises (1), backache (1), and general tonic (1).	14	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Stachys parviflora	Cytotoxic, antibacterial, antifungal sedative, muscle relaxant, and antioxidant properties have been reported (Shakeri, et al., 2019).	Stomachache (2), constipation (1), hemorrhoid (1), infertility (1), childbirth bleeding (2), menstrual pain (1), contusion (3), dermal disorders (1), hypolipidemic (1), antihypertensive (3), antidiabetic (2), and antirheumatic (1).	14	2, *
Olea europaea	Hypotensive, antiarrhythmic, and spasmolytic.	Antihypertensive (9), hypolipidemic (2), antidiabetic (3), antirheumatic (4), body lotion (3), rachitis (1), diuretic (1), liver disorders (1), bile stones (2), and sore throat (1).	14	1
Citrullus colocynthis	Bitter apple irritates the intestinal mucous membrane, increasing liquid production.	Anthelmintic (1), constipation (6), antimicrobial (6), anti-amoebic (1), antidiabetic (5), diuretic (3), anti-hair loss (1), for dermal (1), and bile disorders (1).	16	1
Ficus carica	Unproven Uses: Fig preparations are used as a laxative. In Chinese Medicine used for dysentery and enteritis.	Flatulence (1), memory enhancement (3), fatigue (1), appetizer (3), hyperacidity (1), constipation (3), autoerotism (1), sexual tonic (1), dyspnea (1), pertussis (3), common cold (1), antitussive (4), pneumonia (3), antihypertensive (2), and antiatherosclerotic (1).	16	1
Syzygium aromaticum	Antiseptic, antibacterial, antifungal, antiviral, spasmolytic, and local anesthetic. Proven as a dental analgesic, for inflammation of the mouth, and pharynx.	Hypolipidemic (2), antidiabetic (2), toothache (5), stomatitis (1), antituberculotic (1), antirheumatic (2), antiseptic (1), nerve tonic (3), anti-anxiety (1), neuralgia (1), digestive disorders (10), amenorrhea (1), and contraception (2).	16	1
Cydonia oblonga	Unproven uses: digestive disorders and diarrhea. Coughs and gastrointestinal catarrh and as a compress for injuries, inflammation of the joints, injuries of the nipples, and gashed or deeply cut fingers.	Antitussive (5), bronchitis (9), pneumonia (6), fatigue (1), anticatarrhal (1), gastroenteritis (1), antidiarrhoeal (2), heatstroke (2), sore troth (1), wound healing (1), hoarseness (1), antipyretic (1), aphrodisiac (1), burn	16	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
		(1), antipyretic (1), anti-icteric (1), intestinal disorders (1), depression (1), hemorrhoid (1), and dysuria (1).		
Allium cepa	Antimicrobial, hypolipidemic, hypotonic, antithrombocyte aggregation, antiallergic, and antiasthmatic,. Proved for loss of appetite, arteriosclerosis, dyspeptic complaints, antipyretics and colds, cough/bronchitis, antihypertensive, and inflammation of the mouth and pharynx.	Antihypertensive (1), hypolipidemic (2), blood purifier (1), gastrointestinal disorders (3), intoxication (1), antimicrobial (7), sexual problems (1), dysuria (2), anti-inflammatory (1), bladder & kidney problems (1), and toothache (1).	17	1
Pleurotus eryngii	Antimicrobial, antiviral, antilipidemic, anti-inflammatory, antitumor, antioxidant, hypotensive, hypocholesterolemic, anti-aging, hyperglycemic, hepatoprotective, and immunomodulatory (Patel, et al., 2012b).	Antidiarrhoeal (5), constipation (3), anthelmintic (7), stomachache (2), flatulence (1), and general tonic (1).	17	*
Trigonella foenum-graecum	It has an antidiabetic, emollient, lipid-lowering, and hydrogogic effect. Proven uses: loss of appetite and inflammation of the skin.	Gynecological problems (10), aphrodisiac (3), lactogenic (1), antidiabetic (5), digestive disorders (3), appetizer (5), anti-inflammatory (4), antihypertensive (1), hypocholesterolemic (1), anti-obesity (1), asthma (1), antitussive (1), and foot pain (1).	18	1
Perovskia atriplicifolia	The EO possesses antimicrobial, cytotoxic, and antiviral properties.	Body aches (6), amenorrhea (3), wound healing (1), antimicrobial (1), antipyretic (3), anti-icteric (1), foot pain (3), digestive disorders (5), antispasmodic (2), common cold (6), and anti-inflammatory (2).	18	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Heracleum afghanicum	Green parts are strongly photo-toxic. Sedative and antiviral effects have been reported.	Antihypertensive (4), Antiemetic (2), antiemetic (2), flatulence (1), stomachache (1), antidiarrhoeal (1), sore throat (2), typhoid (2), hepatitis jaundice (1), heatstroke (1), analgesic (1), antipyretic (1), asthma (1), and muscle spasm (1).	19	2
Vitis vinifera	Antiatherosclerotic, antitumor, antioxidant, ischemia prevention, hepatoprotective effects, hair growth.	Kidney problems (4), heatstroke (3), antipyretic (1), sore throat (1), cardiovascular disorders (3), anemia (1), stomachache (1), antidiarrhoeal (1), flatulence (1), and tonic (1).	19	1
Carum carvi	Spasmolytic, antimicrobial, approved for dyspeptic complaints.	Flatulence (2), antidiarrhoeal (1), digestive (2), appetizer (2), constipation (1), gastric ulcer (1), antiemetic (1), common cold (1), and anti-microbial (1).	20	1
Cannabis sativa	Psychotropic action, antiemetic action, anticonvulsive, analgesic, bronchodilator, reduce intraocular pressure, antimicrobial, tumor-inhibiting, circulation; appetizer. Used in painful disorders such as ulcers or cancer; asthma, chronic bronchitis; neuralgia, migraine; urinary tract disorders; anti-anxiety, neurasthenia, or hysteria.	Relaxing (4), insomnia (4), seizure (1), nervous diseases (2), anti-fatigue (1), antidepressant (1), sedative (1), analgesic (6), migraine (1), respiratory disorders (1), antihypertensive (2), hypolipidemic (1), amenorrhea (1), Parkinson's disease (1), antiemetic (1), antigout (1), antirheumatic (3), pertussis (1), antituberculotic (1), and antispasmodic (2).	20	1
Papaver somniferum	Narcotic analgesic, antitussive, spasmolytic, and vasodilator.	Analgesic (12), antitussive (7), hypnotic (7), sedative (4), antidiarrhoeal (3), antiemetic (1), bronchitis (2), pneumonia (1), and to reduce libido (2).	20	1
Tribulus terrestris	Improving sexual function, antidiuretic, cardiovascular, neuroprotective,	Kidney disorders (12), bladder inflammation (1), urinary tract stones (1), aphrodisiac (2), gonorrhea (2),	20	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
	antitumor, antioxidant, antibiotic, hepatoprotective, anti-inflammatory, anti-carious, and anthelmintic.	hemorrhage (2), stomachache (1), gastric ulcer (1), and constipation (1).		
Ziziphora clinopodioides	Antibiotic, hypotensive, and anti-inflammatory, effects have been reported.	Antihypertensive (5), hypolipidemic (4), digestive disorders (14), foot pain (2), common cold (3), antipyretic (1), backache (2), amenorrhea (1), menstrual infection (2), antimicrobial (1), antiseptic (1), respiratory tracts infectious (3), and antiviral (1).	21	2
Cinnamomum zylanium	Anti-microbial and anti-parasitic activity, hypoglycemic, antioxidant, hypotensive, hypocholesterolemic, anti-secretagogue, and anti-ulcer effects, anti-nociceptive and anti-inflammatory activity, wound healing, and hepatoprotective effects (Ranasinghe, et al., 2013).	Tonic (3), stimulant (1), sexual tonic (3), heart disorders (4), hypolipidemic (6), antidiabetic (2), pain (2), antidyspeptic (2), antidiarrhoeal (4), heart failure (1), flatulence (3), anti-hemorrhagic (1), wound healing (4), anti-arthritic (2), anti-arthritic (2), acne (3), and antirheumatic (1).	21	*
Verbascum thapsus	Mullein alleviates irritation and has an expectorant effect due to its mucin and saponin content. Approved by Commission E for cough and bronchitis.	Anti-inflammatory (5), antidiarrhoeal (3), flatulence (2), abdominal pain (1), hemorrhoid (1), respiratory disorders (3), antidiabetic (1), infertility (3), anti-icteric (2), antiseptic, acne (2), anti-arthritic (1), and for bone fracture (2).	21	1
Equisetum arvense	It has a mild diuretic and spasmolytic effect in animal tests. Flavonoids and silicic acid contribute to the astringent effect. Approved for Infections of the urinary tract, kidney, and bladder stones, wounds, and burns.	Kidney disorders (7), nephritis (1), cystitis (1), urinary incontinence (1), gonorrhea (1), prostatitis (1), digestive (1), constipation (1), stomatitis (1); whitening, flourishing, and mount deodorizer (1), backache (5), and bronchitis (2).	22	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Ocimum basilicum	In vitro, experiments showed an antimicrobial effect.	Antidepressant (1), nervous tonic (6), sedative (5), hypnotic (2), headache (3), migraine (3), vertigo (1), neurological diseases (3), gastrointestinal diseases (13), antidiarrhoeal (1), antispasmodic (4), pertussis (1), sore throat (2), grippe (1), antipyretic (1), amenorrhea (3), general tonic (1), diuretic (1), and lactogenic (2).	22	1
Rheum ribes	Approved against constipation.	Against constipation (2), hypolipidemic (4), antihypertensive (4), antidiabetic (3), antiemetic (1), bronchitis (1), common cold (1), vitamin deficiency (1), anemia (2), abdominal pain (1), heatstroke (1), bruises (2), and food (1).	22	1
Crocus sativus	Small doses of Saffron stimulate the secretion of gastric juices. Large doses stimulate the smooth muscle of the uterus.	Sedative (4), antidepressant (1), nervous disorders (3), insomnia (3), memory improvement (2), vertigo (2), epilepsy (1), aphrodisiac (7), heart disorders (3), antispasmodic (3), appetizer (1), anticancer (1), eye disorders (1), common cold (1), digestive disorders (9), antidiabetic (1), and uterine bleeding (1).	24	1
Brassica rapa subsp. *rapa*	Taproots are widely used as a traditional medicine against the common cold, as an antitussive, and as a digestive. Antioxidant and anticancer activities have been reported.	Bronchitis (2), antitussive (6), common cold (14), pneumonia (4), aphrodisiac (2), antidiabetic (4), flatulence (1), constipation (1), antidysenteric (1), and antidiarrhoeal (1).	25	2
Salvia rhytidea	Antimicrobial and antifungal (anti-yeast), cytotoxic and antimalarial, and gastrointestinal properties have been	Headache (2), backache (2), pneumonia (6), antitussive (3), bronchitis (3), stomachache (8), digestive (3), peptic & duodenal ulcer (1),	25	

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
	reported, also antipyretic and analgesic effects.	antirheumatic (1), anti-inflammatory (2), bactericide (1), antidiabetic (1), and antihypertensive (1).		
Rumex crispus	Anti-inflammatory, purgative, antioxidant, antitumor, antibacterial, antiplasmodial, and antidiabetic effects (Vasas, et al., 2015).	Constipation (3), Antidiarrhoeal (3), emollient (1), stomachic (2), antihypertensive (1), hypolipidemic (2), anti-inflammatory (1), hepatitis (1), bile disorders (2), toothache (1), dermal rashes (2), wound healing (1), antipyretic (2), pneumonia (1), and dyspnea (1).	25	*
Coriandrum sativum	Coriander EO stimulates the secretion of gastric juices and is carminative and spasmolytic; its antibacterial and antifungal effects are reported. Used for dyspeptic complaints and loss of appetite.	Digestive disorders (23), antispasmodic (3), constipation (1), otitis(1), eye pain (2), common cold (1), pneumonia (1), hypolipidemic (1), aphrodisiac (3), headache (1), migraine (1), and antihaemorrhagic (1).	26	1
Cuminum cyminum	Antimicrobial, estrogenic, galactogen, antispasmodic, carminative, aphrodisiac, diuretic, stimulant, and analgesic.	Digestive disorders (35), antimicrobial (6), common cold (1), pneumonia (2), hypolipidemic (2), and lactogenic (3).	26	1
Centaurea pulchella	Antioxidant activity, as well as for the treatment of peptic ulcer, malaria, common cold, stomach upset, abdominal pain, and herpes infections around the lips, were reported in the literature (Khammar & Djeddi, 2012).	Antidiabetic (12), blood purifier (2), antihypertensive (2), headache (2), sore throat (3), dermal rashes (2), anthelmintic (3), digestive disorders (3), antipyretic, antimalarial (1), heatstroke (1), hepatitis (1), common cold (1), and kidney problems (2).	26	*
Ferula sp.	The identity of this plant is not fully known. Hence, it is not clear whether it has been scientifically studied or not.	Stomachache (10), flatulence (7), antidiarrhoeal (1), antispasmodic (1), get rid of “Jinn” (1), the “Evil eye” (2), kidney problems (2), antidiabetic (3), antihypertensive (1), menstrual pain (1), and anti-infertility (1).	27	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Nigella sativa	Antibiotics (antiseptic, antifungal), insecticidal, anti-inflammatory, analgesic, antispasmodic, and digestive activities have been reported, also applied to trigger blood circulation and blood sugar level, and as a diuretic, to provoke bilious secretion and menstruation.	Flatulence (4), stomachache (6), laxative (2), GI infectious (1), lactogenic (4), anti-inflammatory (4), antidiabetic (7), hypolipidemic (4), antitussive (3), anthelmintic (2), kidney disorders (7), anti-hair loss (1), and nervous disorders (2).	27	2
Curcuma longa	Anti-inflammatory, anti-HIV, antibacterial, antioxidant, anti-nematocidal. These activities are attributed to curcumin (Araujo & Leon, 2001).	Stomachic (1), digestive disorders (6), flatulence (6), appetizer (2), liver disorders (1), bone fracture (4), bruise (3), analgesic (7), blood purifier (1), antipyretic (1), and antimicrobial (1).	27	*
Daucus carota	Anthelmintic, antimicrobial, and mild vermifuge. The pectin content is probably responsible for the severe constipating effect. The EO has a mild bactericidal effect, especially on gram-positive bacteria. The drug has a positive effect on visual acuity and scotopic (twilight) vision, as well as being a mild diuretic.	Eye tonic (9), nyctalopia (7), rejuvenation of skin (4), aphrodisiac (3), infertility (1), antiemetic (1), antidiarrhoeal (2), intestinal pain (1), flatulence (2), stomachic (1), hemorrhoid (1), hyperacidity (1), jaundice (1), colon cancer (1), bone fractures (4), tonic (1), and anti-obesity (1).	30	1
Nepeta juncea	Antimicrobial activities.	Stomach disorders (8), antispasmodic (1), hemorrhoid (1), headache (2), sedative (1), insomnia (2), nervous problems (2), analgesic (12), backache (3), anti-arthritic (7), amenorrhea (4), menstruation (2), anti-inflammatory (4), abortion (1), for infertility (6), gonorrhea (1), common cold (1), and antibacterial (1).	30	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Rosa damascena	Anti-inflammatory, bactericidal, antipyretic, antispasmodic, hypnotic, analgesic, laxative, anticonvulsant, antidiabetic, and antioxidant.	Stomachache (7), stomach problems (11), constipation (4), antidiarrhoeal (2), flatulence (3), antihypertensive (1), antitussive (4), bronchitis (3), dyspnea (2), for acne (1), hepatitis (1), headache (2), amenorrhea (1), and anti-hair loss (1).	30	2
Plantago lanceolata	Liquid extract and juice have a proven bactericidal effect. Also, acceleration of blood clotting has been demonstrated and a possible epithelization effect has been mentioned.	Sore throat (15), pharyngitis (1), antitussive (1), antidiarrhoeal (4), digestive disorders (4), stomachache (2), stomatitis, flatulence (1), common cold (1), influenza (2), antipyretic (3), and heatstroke (4).	31	1
Nepeta glutinosa	Cytotoxic, anti-inflammatory, antioxidant, antibacterial, antifungal, insecticidal, and insect-repellent effects of Nepeta spp. have been reported.	Backache (6), bone fracture (16), contusion (3), analgesic (14), anti-arthritic (4), nephritis, antirheumatic (3), diaphoretic, antihypertensive (2), hypolipidemic (1), antidiabetic (2), and anti-obesity (1).	33	*
Zea mays	Stimulate cardiac muscles, hypertensive, diuretic, and sedates the digestive tract. Used for disorders of the urinary tract.	Kidney stones (8), kidney pain (7), nephritis (8), kidney disorders (5), diuretics (1), and UTIs (2).	34	1
Allium sativum	Antimicrobial, hypolipidemic, antioxidative, and fibrinolytic. The antibacterial, antimycotic and hypolipidemic effects have been well-documented and approved to use for arteriosclerosis, antihypertensive, and hypercholesterolemia.	Antihypertensive (23), hypolipidemic (4), antiatherosclerotic (2), heart problem (2), antiseptic (3), antibacterial (2), appetizer (3), digestive disorders (6), anti-inflammatory (1), common cold (1), hair tonic (3), respiratory disorders (4), and for bedwetting of child (1).	35	1
Elaeagnus angustifolia	Antimicrobial, insecticidal, antioxidant, anti-arthritic, wound healing,	Digestive disorders (13), antidiarrhoeal (13), hypolipidemic (5), antihypertensive (3), antidiabetic	36	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
	hypolipidemic, anti-nociceptive, antitumor, anti-inflammatory, anti-mutagenic, and gastroprotective activities have been reported.	(3), blood purifier (1), dermal disorders (2), anti-obesity (2), kidney disorders (5), common cold (1), brain tonic (1), and aphrodisiac (1).		
Plantago psyllium	Laxative and antidiarrhoeal; regulate intestinal peristalsis through the swelling effect. Approved by Commission E for diarrhea and constipation.	Stomachache (10), peptic ulcer (4), digestive disorders (10), antidiarrhoeal (2), hemorrhoid (1), antitussive (5), expectorant (1), heatstroke (6), antipyretic (4), and hypocholesterolemic (1).	36	1
Fumaria officinalis	Antispasmodic effect on the bile ducts and the gastrointestinal, amphicholeretic. Approved for liver and gallbladder complaints, spastic discomfort in the area of the gallbladder and bile ducts, as well as the gastrointestinal tract.	Dermal disorders (19), acne (13), sore throat (2), digestive disorders (10), appetizer (4), liver disorders (2), hepatitis (4), anti-icteric (3), hemorrhoid (2), amenorrhea (1), hypolipidemic (2), and blood purifier (4).	37	1
Zingiber officinale	Ginger roots are positively inotropic, antithrombotic, antioxidant, antimigraine, and antilipidemic effects, and promote the secretion of saliva, gastric juices, and bile.	Flatulence (16), abdominal pain (7), appetizer (7), stomachache (2), antiemetic (2), constipation (2), digestive, hemorrhoid, sore throat (4), common cold (2), bone pain (2), myalgia, antihypertensive (2), headache (2), backache (4), anti-arthritic (7), foot pain (3), antirheumatic (6), amenorrhea (2), aphrodisiac (2), and dermatitis (1).	37	1
Chamomilla recutita	Gastrointestinal effects, antineoplastic, anti-inflammatory, antioxidant, anxiolytic. Used for cough/bronchitis, fevers, and colds, inflammation of the skin, mouth, and pharynx; infectious wound healing, and burns.	Antipyretic (2), antiseptic (2), digestive disorders (38), antidyspeptic (2), anti-inflammatory (8), eczema (2), menstrual disorders (7), antiseptic (1), and anti-hair loss (4).	38	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Punica granatum	Anthelmintic and amoeboid. Effective against diverse tapeworms, ringworms, and nematodes. The tannins in the drug make it useful as an astringent for sore throats, diarrhea, and dysentery.	Antidiarrhoeal (26), anthelmintic (7), antidiabetic (2), hypolipidemic (4), anemia (3), hemorrhoid (1), stomachache (2), liver tonic (1), appetizer (1), and peptic ulcer (1).	39	1
Mentha piperita	Spasmolytic, antiviral, antimicrobial, diuretic, cholagogue, carminative, and mild sedative. Used against liver and gallbladder and dyspeptic complaints. Also, used for convulsive complaints of the gastrointestinal tract as well as gallbladder and bile ducts.	Digestive disorders (37), antispasmodic (4), appetizer (2), headache, antihypertensive (2), antiatherosclerotic (1), toothache (3), common cold (4), antitussive (2), headache (1), antiseptic (1), wound healing (1), and as a spice (2).	40	1
Salix alba	Antipyretic, antiphlogistic, analgesic, and astringent. Used for rheumatism and pain. Salicin is useful in diseases accompanied by fever, rheumatic ailments, headaches, and pain caused by inflammation.	Antipyretic (15), analgesic (4), headache (5), migraine (2), antirheumatic (1), eye pain (2), typhoid (5), antimalarial (5), heatstroke (13), common cold (1), pneumonia (1), and antidiarrhoeal (3).	40	1
Levisticum officinale	Diuretic, sedative, antimicrobial and cholinergic properties. Approved uses Infections of the urinary tract, kidney and bladder stones, and inflammation of the lower urinary.	Antihypertensive (25), hypolipidemic (5), digestive disorders (17), hemorrhoid (2), antispasmodic (1), antidiabetic (2), heatstroke (2), antipyretic (1), dyspnea (1), anticatarrhal (1), and nervous diseases (1).	42	1
Hymenocrater sessilifolius	Antibacterial activities (Zaidi & Crow, 2005).	Digestive disorders (16), body aches (9), backache (2), muscle contraction (3), hepatitis (1), sore throat (3), toothache (1), typhoid (1), antimalarial (1), common cold (4), amenorrhea (2), heatstroke (1),	43	*

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
		antihypertensive (1), hypolipidemic (2), gonorrhea (1), otitis (1), for the beating of scorpion (1).		
Borago officinalis	Unproven uses: coughs and throat illnesses; anti-inflammatory agent for kidney and bladder disorders, as an astringent and to treat rheumatism. Blood purifier; for chest and peritoneal inflammation, rheumatism of the joints; analgesic, sedative, cardiotonic, sudorific; performance enhancer; for phlebitis and menopausal complaints.	Kidney stones (9), nephritis (3), kidney problems (13), bladder stone (1), pain (7), heart disorders (6), nerve disorders (5), relaxing (6), pneumonia (2), dyspnea (2), antirheumatic (1), herpes simplex (1), rubella (1), abscess (1), muscle pain (1), diaphoretic (1), blood purifier (2), and flatulence (2).	44	1
Peganum harmala	Cardiovascular, neurologic, antimicrobial, insecticidal, antineoplastic, antiproliferative, gastrointestinal, and antidiabetic effects have been reported.	Antiseptic (5), analgesic (10), the evil eye (7), flatulence (7), constipation (6), stomachache (2), antimicrobial (9), toothache (3), anti-inflammatory (3), acne (1), uterus pain (1), hypnotic (1), and menorrhagia (1).	44	2
Juglans regia	Walnut has astringent, fungistatic, and astringent effects. Approved against Inflammation of the skin and excessive perspiration.	Fruit septa for kidney diseases (16), bladder stones (1), cystitis (2), and leishmaniasis (2); seeds as hypolipidemic (16), blood purifier (1), antidiabetic (9), antihypertensive (2); common cold (3), brain tonic (3); leaves as a hair tonic (1), anthelmintic (1), and dental whitening (7).	47	1
Malva neglecta	The plant has considerable antioxidant and wound-healer properties (Saleem, et al., 2020).	Anti-inflammatory (7), wound healing (2), antitussive (14), bronchitis (4), sore throat (17), common cold (2), heatstroke (7), digestive (1), antipyretic (7), peptic ulcer (1), constipation (7), antidiarrhoeal (3), hemorrhoid (1), nephritis (1), cystitis (1), dermal	47	*

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
		disorders (8), demulcent (1), conjunctivitis (1), diuretic (1), amenorrhea (1) and abdominal pain (5).		
Ephedra gerardiana	Sympathomimetic for the central nervous system. Positively inotropic and positively chronotropic, bacteriostatic, and antitussive. Approved use: cough/bronchitis.	Antihypertensive (14), dyspnea (5), pneumonia (5), antitussive (2), wound healing (4), stomatitis (3), antispasmodic (1), digestive disorders (18), and mydriatic (2).	49	1
Artemisia sieberi	The aqueous extract and EO show antimicrobial activity in laboratory tests.	Digestive disorders (37), wound healing (1), antidiabetic (3), and antihypertensive (3).	52	
Urtica dioica	The diuretic, local anesthetic, and analgesic effects have been observed. The anti-inflammatory effect and its effectiveness in benign prostatic hyperplasia were also reported.	Gonorrhea (19), kidney & bladder disorders (13), dysuria (5), diuretic (2), antidiabetic (3), prostatic hyperplasia (3), antihypertensive (2), hemorrhoid (4), flatulence (2), antidiarrhoeal (2), anti-arthritic (3), and antirheumatic (3).	52	1
Trachyspermum copticum	Relaxant effect on tracheal smooth muscles, inhibitory effect on histamine (H1) receptors, stimulatory effect on Beta-2-adrenoceptors, and antitussive and bronchodilatory effects.	Digestive disorders (50), pneumonia (5), anthelmintic (2), backache (2), infertility (1), and as a spice (1).	58	2
Prunus cerasus	Anti-inflammatory and analgesic, uric acid lowering, triggering of blood circulation, blood sugar level, and metabolic functions are reported.	Kidney disorders (40), urinary tract diseases (7), diuretics (1), anemia (1), heatstroke (1), hepatitis (3), liver disorders (4), blood purifier (4), and hypolipidemic (4).	58	2
Alhagi pseudalhagi	Antiulcerogenic, antidiarrhoeal, diuretic, antimicrobial, antioxidant, and cytotoxic effects were reported.	Kidney problems (18), bladder problems (5), digestive disorders (30), appetizer (5), anti-icteric (2), antidiabetic (4), typhoid (6), hepatitis (2), antimalarial	61	2

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
		(3), sunstroke (3), antihypertensive (3), hemorrhoid, and blood purifier (2).		
Anethum graveolens	Antispasmodic effect on the smooth muscles of the gastrointestinal tract, and a bacteriostatic effect. Approved for dyspeptic complaints.	Antihypertensive (34), antidiabetic (2), digestive disorders (13), spice (2), and lactogenic (3).	63	1
Artemisia alba	Anthelmintic, antispasmodic, antifungal, antimicrobial, antidiabetic, antimalarial, antioxidant, and antihypertensive effects (Moufid & Eddouks, 2012).	Anthelmintic (14) and digestive disorders (28).	63	*
Mentha longifolia	Carminative and stimulant.	Digestive disorders (55), appetizer (3), sedative (2), memory enhancement (1), nervous problems (1), antitussive (2), sore throat (2), dyspnea (1), antipyretic (2), kidney disorders (3), rheumatic pains (4), spice (4), antihypertensive (6), hypolipidemic (5), heatstroke (2), antidiabetic (3), and for weight gain (1).	68	1
Artemisia absinthium	Cholagogue, digestive, appetizer, wound healing, antipyretic, and antimalarial. Used for loss of appetite, dyspeptic complaints, and for liver, and gallbladder complaints.	Antidiabetic (23), hypolipidemic (8), flatulence (7), stomachache (9), appetizer (2), anthelmintic (8), and analgesic (14).	70	1
Glycyrrhiza glabra	Anti-inflammatory, antiplatelet, antiulcer, antiviral, antifungal and mineralocorticoid effects, Used for cough, bronchitis, and gastritis.	Gastrointestinal disorders (83), antitussive (18), bronchitis (10), pneumonia (6), expectorant (2), anti-inflammatory (2), nephritis (1), diuretic (2), and anti-icteric (3).	83	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
Descurainia sophia	Against intestinal and hepatic disorders, for skincare, against throat diseases. Moderate toxicity to humans because of cardenolides and mustard oil. Antibiotic, cardiotonic, diuretic, antioxidant, antitumor, and anticancer activities have been reported.	Antidiarrhoeal (21), for constipation (21), stomachache (18), flatulence (3), antiemetic (5), appetizer (4), stomachic (2), heatstroke (14), antipyretic (20), hepatitis (6), anti-icteric (4), against typhoid (4), pneumonia (6), antitussive (6), and anti-obesity (2).	86	2
Berberis integerrima	Antidiabetic, lipid-lowering, antipyretic, antioxidant, hepatoprotective, antimicrobial, anti-inflammatory, and anticancer activities (Srivastava, et al., 2015).	Bone fracture (29), bruise (14), liver problems (5), hepatitis (7), wound healing (4), antihypertensive (9), hypolipidemic (13), anti-obesity (1), appetizer (9), choleretic (3), peptic ulcer (3), constipation (2), and heatstroke (3).	90	*
Plantago major	Anti-ulcer, immune-modulatory, antibiotic, antiviral, antioxidative, and diuretic effects have been described.	Against constipation (19), stomachache (20), antidiarrhoeal (4), pneumonia (18), bronchitis (9), sore throat (8), expectorant (4), antitussive (13), wound healing (8), dermal rashes (8), baby feeding (5), influenza (3), heatstroke (4), hypolipidemic (1), and antihypertensive (1).	94	2
Althaea officinalis	Anti-inflammatory, anticomplementary agent, immune stimulant, and hypoglycemic. Approved for cough and bronchitis.	Respiratory disorders (5), bronchitis (14), gingivitis (1), antitussive (34), sore throat (12), common cold (18), pneumonia (21), stomachache (4), and constipation (8).	95	1
Foeniculum vulgare	Antispasmodic, and secretolytic (anethole and fenchone) have been reported in the respiratory tract. Aqueous extracts raised the mucociliary activity of the ciliary	Antispasmodic (3), digestive disorders (95), respiratory disorders (2), expectorant (1), antitussive (4), bronchitis (2), pneumonia (2), lactogenic (1), antipyretic (4), common cold (3), diuretic (4),	99	1

Scientific name	Rational use	Traditional use (use number)	FQ	Ref
	epithelium. It is approved for cough, bronchitis, and dyspeptic complaints.	amenorrhea (3), anti-obesity (2), anemia (3), eye disorders (3), and tonic (1).		
Achillea wilhelmsii	Wound healing, antispasmodic, sedative, bactericidal, and antioxidant activities were reported. It is used against stomach and intestinal disorders, skin problems, and pains.	Digestive disorders (85), anthelmintic (2), antiemetic (2) kidney problems (6), and menstrual pain (1).	112	2
Cichorium intybus	An antioxidative, choleretic, negatively chronotropic, and negatively inotropic, cholagogue; hypocholesterolemic, and antidyspeptic. It is approved for loss of appetite and dyspeptic complaints.	Hepatitis (30), anti-icteric (24), liver disorders (10), appetizer (17), typhoid (33), antipyretic (38), antimalarial (15), heatstroke (16), headache (17), antihypertensive (8), blood purifier (8), antidiabetic (9), hypolipidemic (11), stomach disorders (15), and analgesic (6).	155	1

Most of these very frequently used medicinal plants in the Kabul and Parwan provinces are native to the region, but some were imported from other countries mostly Pakistan, India, and Iran because Indian Medicine and Unani Tibb have a strong influence on the philosophy of the traditional medicine of Afghanistan. They influenced the plants used in the treatment of different affections in our country since ancient times.

4.3 Significance of reported applications

The traditional applications of plants for curing diseases are an important factor in determining the usefulness of plant species by local people. Some plants are indeed more useful in certain used categories than others. Local people commonly use selected plant species for particular purposes. This is based on empirical knowledge accumulated by several generations over years of practice. The application of plants reported by local communities is often linked to purpose-specific characteristics of plants, such as efficacy to cure symptoms or reducing or illuminating causative features related to particular health conditions, etc. The major constituents and biological activity of the most commonly used plants in our study area as reported in the literature are summarized in Tables 12 and 14. These are discussed in more detail in the following section.

4.3.1 Neuroprotective effects

The *Ziziphus jujuba* fruit, which is used as a sedative as well as for the treatment of anxiety and restlessness in our study area, has been shown to have anti-cancer, anti-inflammatory, anti-obesity, immunostimulating, antioxidant, hepatoprotective, and gastrointestinal protective activities as well as antifungal, antibacterial, anti-ulcer, sedative, antiseptic, anti-fertility (contraception), hypotensive, anti-nephritic, and cardiotonic properties. Recently, nootropic (memory enhancers) and neuroprotective properties of the fruit have also been reported (PDR, 2007).

Cannabis sativa is used in nervous diseases as an analgesic, anti-fatigue, antidepressant, relaxing, insomnia, and so on in traditional medicine of Kabul and Parwan provinces. Also psychotropic action, anticonvulsive, analgesic, antiemetic, appetite stimulant, bronchial dilation, intraocular pressure-lowering of eyes, antimicrobial, and tumor-inhibiting effects have been reported. It is approved for painful disorders of the alimentary canal such as ulcers or cancer; neuralgia, migraine; mental disorders such as anxiety, neurasthenia, or hysteria; respiratory disorders such as asthma, chronic bronchitis, and urinary tract disorders (PDR, 2007).

Amygdalus communis (seeds) is used as a brain tonic, and aphrodisiac, for relaxing and nervous disorders. It has been reported to contain fatty oil (43-57%), mucilages (3-4%), arabinogalactans, and proteic substances (20-25%). In addition, the above-mentioned substance, bitter almond, contains amygdalin (0.2-8.5%), a cyanogenic poisonous glycoside. Therefore, PDR considered it a poison and stated that the consumption of 10 bitter kernels may be fatal for a child and 60 for an adult (PDR, 2007).

4.3.2 Cardiovascular effects

The crushed fruits of *Anethum graveolens* are internally applied as teas and powders against hypertension and other CVDs in our study area. This species has been reported to have an antispasmodic effect on the smooth muscles of the gastrointestinal tract, bacteriostatic, anti-inflammatory, analgesic, gastric mucosal protective, antisecretory effect, and hypolipidemic activities. Moreover, its herb is used in modern phytotherapy for the prevention and treatment of disorders of the gastrointestinal tract, kidney, and urinary tract, sleep disorders, and spasms (Keusgen, et al., 2020; PDR, 2007).

Comminuted herbs and roots of *Levisticum officinale* are traditionally used against hypertension and hyperlipidemia. Also, diuretic, sedative, antimicrobial, antispasmodic, and cholinergic activities have been reported. The traditional use of the comminuted herb for digestive disorders is possibly based on the aromatic odor produced by phthalide as well as on the bitter flavor, which rises saliva and digestive secretions. The drug is approved by Commission E for the treatment of UTIs and kidney and bladder stones (PDR, 2007).

Allium sativum and onions, commonly used against hypertension and hyperlipidemia, are rich in allicin. Modern studies have demonstrated that allicin has cholesterol-lowering activity and inhibits platelet aggregation (Keusgen, et al., 2020). *Allium sativum* is one of the best-studied sources with hypolipidemic and antiatherosclerotic properties, and it is one of the most commonly used herbs in the management of hyperlipidemia, as well as other CVDs (Badal & Delgoda, 2017).

In the form of tea, *Convolvulus arvensis* fresh herb is used for internal use against hypertension and hyperlipidemia in our study area. It has been reported to contain tropane derivatives alkaloids and the pyrrolidine alkaloid cuscohygrine. Furthermore, cardiovascular active glycosides are present, and antihypertensive, antispasmodic, anti-inflammatory, and styptic activities were demonstrated in animal experiments (Keusgen, et al., 2020).

Ephedra gerardiana contains 2-aminophenylpropane-type alkaloids like ephedrine, which stimulate both α-adrenergic and β-adrenergic receptors. It stimulates the CNS and raises blood pressure by vasoconstriction and increasing cardiac output. The herb is bacteriostatic, positively inotropic, and positively chronotropic (PDR, 2007).

Camellia sinensis is very common all around the country in the form of tea. It has been shown that its consumption decreases total TC, LDL, and blood pressure so that it improves cardiovascular dysfunction. These activities have been documented in several clinical trials as well as in numerous animal studies (Badal & Delgoda, 2017).

Olea europaea leaves and FO have been reported to have hypotensive, antiarrhythmic, and spasmolytic effects on the smooth muscle of the intestine. These effects have been attributed to the terpenes and phenols of dry drugs. Furthermore, cardioprotective effects have also been reported (Keusgen, et al., 2020; PDR, 2007).

Berberis integerrima is used against hypertension, hyperlipidemia, and obesity in Kabul and Parwan regions. Its main alkaloid, berberine, has been shown to have a lipid-lowering effect in a placebo-controlled study, where berberine was administered to patients for 3 months. In this study, the reduction of total plasma cholesterol (TC) by 29%, triglyceride (TG) by 35%, and LDL by 25% was found. Plasma cholesterol levels are directly influenced by the level of LDL receptor expression in hepatocytes. Therefore, hepatic LDL receptors are an important therapeutic target to control lipid levels and prevent atherosclerosis. Berberine has been shown to rise hepatic LDL receptor mRNA and protein expression (Badal & Delgoda, 2017).

Ziziphora clinopodioides has a wide range of traditional applications in our study area, especially for hypertension and hyperlipidemia. It has been reported to contain EO with pulegone, piperitenone, cineole, neomenthol, menthol, carvacrol, and menthone as main constituents. The plant exhibited antibiotic, antihypertensive, and anti-inflammatory effects in modern studies (Keusgen, et al., 2020).

Rheum ribes young stems and leaf stalks are used as a vegetable in Afghanistan since ancient times. It is believed to be useful for CVD and therefore traditionally used against hyperlipidemia, hypertension, and anemia in our study area, and has been reported to contain anthraquinones (chrysophanol, parietin, and emodin), and flavonoids (quercetin derivatives and fisetin) in addition to oxalic acid. It has been reported that its rootstock extracts exhibited antimicrobial, antifungal as well as radical scavenger activity, in higher doses a laxative effect because of the content of anthraquinones. WHO approved it for the short-term treatment of

occasional constipation. However, it is used to treat hypotension, increase peripheral vasodilation, and inhibit blood coagulation in different folkloric medicines (Keusgen, et al., 2020; WHO, 1999-2009).

Crataegus songarica, which has traditionally been used against heart diseases, hypertension, and hyperlipidemia in the form of an infusion, has been reported to contain the active principles of procyanidins and flavonoids. They have a vasodilator effect and increase coronary blood flow resulting in an improvement of myocardial blood flow. Its cardiotonic effect is said to be caused by the increased membrane permeability for calcium as well as the inhibition of phosphodiesterase with an increase in intracellular cyclo-AMP concentrations. The use of the drug for congestive heart failure, hypertension, atherosclerosis, and hyperlipidemia will be documented and approved by Commission E for a decrease in cardiac output (PDR, 2007).

The cholesterol-lowering and anti-lipid oxidation effects of the *Malus domestica* fruit have been reported in modern pharmacological experiments. Literature reveals that the plant decreases TC, LDL, and TG and increase HDL level when tested in animals. This effect is attributed to antioxidant activity and may be due to the inhibition of lipid peroxidation (Patel, et al., 2012).

Rubus species have a high antioxidant capacity, which may be useful for the treatment of hyperlipidemia. Szajdek & Borowska (2008) reported that *Rubus fruticosus* has scavenging activity against DPPH, 2, 2-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) and OH radicals, and other reactive forms of oxygen. It inhibits the oxidation of LDL liposomes and prevents the formation of NO radicals.

The fresh and dry fruit of *Vitis vinifera* is traditionally used in the treatment of cardiovascular disorders and anemia in our study area. It has been reported to contain flavonoids including kaempferol-3-O-glucosides, quercetin-3-O-glucosides, and proanthocyanidins. Its seeds extract exhibits antiatherosclerotic, antitumor, antioxidant, hepatoprotective, and ischemia prevention effects in animal experiments as well as in clinical trials (PDR, 2007).

4.3.3 Respiratory protective effects

The most important species for the treatment of respiratory diseases in our study area are *Plantago major* and *P. lanceolata* (Plantaginaceae), *Cydonia oblonga* (Rosaceae), *Malva neglecta*, and *Althea officinalis* (Malvaceae), *Brassica rapa* subsp. *rapa* (Brassicaceae), *Salvia rhytidea* (Lamiaceae), *Glycyrrhiza glabra* and *Sophora alopecuroides* var. tomentosa

(Fabaceae), *Ficus carica* (Moraceae), *Papaver somniferum* (Papaveraceae), and *Datura stramonium* (Solanaceae). Among these, *Plantago* spp., *Cydonia oblonga* (Rosaceae); *Malva neglecta,* and *Althea officinalis* (Malvaceae) are rich in mucilage. Mucilaginous plants cover the mucosa and therefore are useful for the treatment of upper respiratory affections such as cough and sore throat.

Due to saponin and flavonoid content, *Glycyrrhiza glabra* roots are validated for their anti-inflammatory and expectorant effects. Besides, the antibacterial effects of the plant have been well documented. It has been reported that licoricidin, a strong flavonoid compound in the root, inhibits isoPAF (platelet-activating factor) acetyltransferase resulting in anti-inflammatory activity. Also, glycyrrhizin has anti-inflammatory activity due to inhibitory effects on thrombin-induced platelet aggregation. The drug could be effective for many infectious diseases. It is a typical element of cold and flu remedies and is used for the treatment of bronchitis. Overdosage (above 50 g/day) for a long time will cause hypokalemia, edema, hypertension, and cardiac disorders. Therefore, usage is not recommended for longer than 6 weeks (PDR, 2007).

The *Ficus carica* (Moraceae) fruit contains furanocoumarins including pasoralen, bergaptene, citric acid, malic acid, sugars (ca. 50%), pectin, mucilages, and vitamins B and C. Preparations of the figs are used as a laxative. In China, figs are used for dysentery and enteritis. *Papaver somniferum* dried capsules are used in the form of infusion against a cough in our study area. Due to its codeine content, the drug is useful for the treatment of dry cough. *Datura stramonium* (Solanaceae) is approved for its anticholinergic and parasympatholytic effects. It has a bronchodilatory effect and can be used for bronchitis and asthma. In folk medicine, it is used to cure asthma, irritant cough, bronchitis, influenza, and catarrh and as an expectorant (PDR, 2007).

Ephedra gerardiana (Ephedraceae) is commonly used in respiratory affections and has been reported to contain mainly ephedrine. It stimulates β-adrenergic receptors in the lungs which results in bronchodilation. In animal experiments, the antitussive effect of ephedrine has been observed and the drug is approved for the treatment of cough and bronchitis. Also, it has a bacteriostatic effect (PDR, 2007).

The *Salvia rhytidea* (Lamiaceae) herb contains EO with a high amount of hydrocarbon and oxygenated monoterpenes, such as spathulenol, pulegone, sabinene, and copaene. It is used for abdominal and dermal disorders as well as for respiratory disorders. Also, antimicrobial,

antifungal, antimalarial, antipyretic, analgesic, and cytotoxic activities have been reported. The fleshy root of *Brassica rapa* subsp. *rapa* has traditionally been used in the form of juice or cooked against the cough and cold in our study area. It has been reported to have mustard oil glycosides which may cause an antibiotic effect. Also, it contains traces of carbohydrates and protein, some vitamins and minerals like calcium and manganese, and xanthophylls (lutein). The fleshy taproots are widely used as traditional medicine against the common cold, as an antitussive, and as a digestive. It has been reported to have antioxidant and anticancer activities (Keusgen, et al., 2020).

4.3.4 Gastrointestinal effects

In the traditional medicine of Kabul and Parwan provinces, *Glycyrrhiza glabra* and *G. uralensis* Fisch. ex DC. are used against digestive disorders. Literature reveals that plants have anti-inflammatory and anti-ulcerative effects. These effects are attributed to glycyrrhizic acid content. This saponin suppresses the formation of prostaglandins and can prevent ulceration inside the stomach and the duodenum. Furthermore, the degradation of cortisol is slowed down in the liver and the kidney. Unwanted side effects are subsequent stimulation of the mineralocorticoid receptors as well as a decrease in blood levels of renin, potassium, and aldosterone, leading to increased blood pressure. Therefore, the intake of *Glycyrrhiza* roots should exceed 2.5 g per day (about 100 mg of glycyrrhizic acid) (Keusgen, et al., 2020)

The laxative effect of the rhubarb (*Rheum* spp.) rhizome is smooth because it also contains tannins leading to a very bitter taste in the underground parts of this plant. The usage of anthraquinone-containing plant materials for longer than 2 weeks is not recommended (Keusgen, et al., 2020). The laxative effect is due to the hydrogogic and antiabsorptive properties of the anthranoids. This effect causes an increase in the volume of the intestinal contents resulting in pressure and stimulation of intestinal peristalsis (PDR, 2007).

Members of Malvaceae as *Althaea* spp., *Malva* spp.; Linaceae (like *Linum usitatissimum*) and Plantaginaceae (e.g. *Plantago* spp.), as well as *Descurainia sophia* (Brassicaceae) are used against gastrointestinal disorders as well as respiratory affections and contain a high amount of mucilage. The internal use of mucilaginous drugs soaked in water covers the mucosa and can be used against dry cough as well as against irritations of the intestine mucosa like gastritis, enteritis, or colon irritability (Keusgen, et al., 2020). The drug relieves local irritation, inhibits mucociliary activity, stimulates phagocytosis, and acts as an anti-inflammatory, immune stimulant, and hypoglycaemic agent. The efficacy of mucilaginous preparations has been

demonstrated when using it as a gargle for inflammation of the mucous membrane of the mouth and throat (PDR, 2007).

Plants species like *Cichorium intybus, Centaurea pulchella,* and *Taraxacum officinale* are used against liver and gallbladder diseases in the traditional medicine of Kabul and Parwan provinces. They contain bitter principles, and these substances are improving gastrointestinal excretion. Therefore, the moderate use of bitter-tasting species improves digestion and overdosage will result in vomiting (Keusgen, et al., 2020). Further on, an anti-oxidative, choleretic, negatively chronotropic, and negatively inotropic effect has been described as caused by the presence of sesquiterpene lactones, cinnamic acid derivatives, and flavonoids. Animal studies have noted a distinct reduction of pulse rate and contractility, a mild cholagogue effect, and lowered cholesterol levels in rat livers and plasma. Application for dyspeptic complaints seems plausible because of the amaroid (guaianolide) content. Moreover, these plants are approved to treat loss of appetite and dyspeptic complaints (PDR, 2007).

Artemisia sieberi is used against intestinal worms in Kabul and Parwan regions and has been reported to have an anthelmintic and antipyretic effect. These effects are attributed to its α-santonin content. The drug acts as a vermifuge for *Ascaris* and other intestinal parasitic worms, whose muscles are paralyzed by santonin. Worms are then pushed into the large intestine where they are removed by employing a laxative. Further on, santonin affects body temperature correspondingly to dopamine (PDR, 2007).

The *Punica granatum* fruit peel, which is used for diarrhea and dysentery in the study area, has been reported to have an astringent effect due to tannin contents. The bark of roots and stems, which contains alkaloids, is anthelmintic and amoeboid. Pelletierin, its principal marker, is effective against diverse tapeworms, ringworms, and nematodes. The tannins in the drug make it useful as an astringent for sore throats, diarrhea, and dysentery (PDR, 2007).

Alhagi pseudalhagi is traditionally used against a broad array of diseases in our study area including antidiarrhoeal, digestive properties, stomachache, flatulence, appetizer, and jaundice. It has been reported to have antiulcerogenic, diaphoretic, antidiarrhoeal, antimicrobial, antioxidant, diuretic, and cytotoxic properties (Keusgen, et al., 2020; Srivastava, et al., 2014).

Carum carvi, Foeniculum vulgare, Coriandrum sativum, Trachyspermum ammi, and *Cuminum cyminum* are used against a broad array of digestive disorders in our study area. They belong

to the Apiaceae family, and their dried seeds are considered the most common and effective carminative herbs in modern phytotherapy.

Carum carvi contains EO (2-7%) with carvone and limonene as main constituents, and its alcoholic extracts are used as a stomachic for centuries. It has been reported that its EO has a strong antibiotic effect. Additionally, the anti-colitic properties of extracts and essential oil have been reported. *Foeniculum vulgare* contains 2-6% EO that mostly consists of fenchone and anethole. Its seeds are a very effective carminative and act as a mild expectorant. Additionally, antibiotic, anti-inflammatory and antioxidant activities have been reported. It is used in the form of tea in European countries for the treatment of dyspepsia and diarrhea. *Coriandrum sativum* is also considered to have carminative action. It contains up to 2.6% EO, mainly linalool, α-pinene, cis-geranyl acetate, and geraniol. It is used against flatulence and male digestion in modern phytotherapy (Keusgen, et al., 2020; Schulz, et al., 2001). *Trachyspermum ammi* contains EO with thymol, γ-terpinene, and o-cymene as principal constituents. Also antiulcer, increased liver enzymes, increased time and amount of hyperacidity secretion, hepatoprotective, and antispasmodic effects have been reported (Boskabady, et al., 2014). *Cuminum cyminum* contains EO (2.5 to 4.5%) with cumin aldehyde as a major constituent. However, the amount and constituents of EO vary due to geographical regions. The antidiarrhoeal, anti-inflammatory, analgesic, and antimicrobial effects of the drug have been reported in modern pharmacological studies. Furthermore, anticarcinogenic, antibacterial, and astringent effects were reported (Al-Snafi, 2016c; Keusgen, et al., 2020).

Achillea wilhelmsii is traditionally applied against a broad spectrum of diseases in our study area including gastrointestinal disorders. It was reported to have antimicrobial, antitumor, immune-modulating, and vagolytic properties. The medicinal properties of its sister species *A. millefolium* are well studied and the plant is monographed in some pharmacopoeias of Germany, the Czech Republic, France, and Switzerland. Literature reveals that the plant has antimicrobial, anti-inflammatory, anticancer, and also many other activities (Keusgen, et al., 2020; Saeidnia, et al., 2011).

Matricaria chamomilla is traditionally applied externally and internally against a broad array of gastrointestinal disorders in our study area. It is one of the best well-recognized medicinal plants. Its therapeutic effects are attributed to three groups of active constituents namely terpenoids EO (ca. 0.25-1%), with bisabolol and chamazulene as marker components both of which are proven for their anti-inflammatory effect in laboratory experiments. For example, it

is known that chamazulene inhibits leukotriene B4 formation and acts as an anti-inflammatory agent. The proteolytic activity of pepsin is reduced by α-bisabolol in the gastrointestinal tract. In addition, apigenin blocks intercellular adhesion molecule-1 up-regulation and leukocyte adhesion in response to cytokinesis. This effect is due to a mechanism separate from free radical scavenging or leukocyte formation. Flavonoids constitute (ca. 2.4%) a second substance class with apigenin showing a particular antispasmodic effect. Lastly, it contains 5-10% pectin-like mucilage. These substances are released during infusion and rapidly act to quiet the irascibility of gastric mucosa. Based on the above-mentioned properties, chamomile is used internally in modern phytotherapy for the treatment of inflammatory gastrointestinal tract associated with gastrointestinal spasms (PDR, 2007; Schulz, et al., 2001).

Mentha piperita, traditionally applied for a broad array of diseases in our study area has been reported to have a spasmolytic effect on the smooth muscle of the gastrointestinal tract. It has been reported that it is a carminative, cholagogue, antibacterial, insecticidal, and secretolytic herbal drug. Therefore, it is used for convulsive complaints of the gastrointestinal tract as well as gallbladder and bile ducts. It was approved by Commission E for liver and gallbladder complaints as well as for dyspeptic complaints. Also, the carminative, cholagogue, antibacterial, insecticidal and secretolytic effect of peppermint EO has been well documented. *Mentha longifolia* contains EO with main components piperitone (60-80%), and flavonoids including, among others, diosmin, hesperidin, quercitrin, thymonin, and apigenine-7-glucuronide. In addition, carminative and stimulant effects have been reported (PDR, 2007).

Nepeta laevigata (D. Don) Hand.-Mazz., widely applied for different disorders including gastrointestinal disorders in our study area, has been reported to have EO with germacrene D, β-citronellol, α-bisabolol oxide B, and β-caryophyllene as marker components. It is used for fever and sore throats and as a diaphoretic in the traditional medicine of Asian countries. Its radical scavenging and antibiotic activities have been reported in modern pharmacological studies (Keusgen, et al., 2020).

Syzygium aromaticum, an imported drug that is used in our study area, has been reported to have EO with eugenol as the main component. In addition, it contains flavonoids, tannins, triterpenes, and steroids. The anti-inflammatory, antibacterial, antifungal, antiviral, and hepatoprotective properties were reported and approved by Commission E as a dental analgesic and for the inflammation of the mouth and pharynx. Literature reveals that the plant is used for

stomach ulcers and externally for colds and headaches. Also in India, it is used for flatulence, colic, gastropathy, and anorexia (PDR, 2007).

Rosa damascena, traditionally used for stomach problems, stomachache, constipation, diarrhea, and flatulence in our study area, has been reported that the gavage of boiled petal extract displayed significant laxative effects in rats. It increases the watery feces and the frequency of defecation in rats but the intraperitoneal injection of the extract showed signs of constipation. That means that rats have no feces for 24 hrs. After injection. Boskabady et al. explained that the laxative effects are partly due to the osmotic infiltration of fluids into the intestinal lumen. Additionally, anti-inflammatory, antibacterial, antiviral, antioxidant, antitussive, hypnotic, hypoglycaemic, and relaxant properties were reported (Boskabady, et al., 2011).

Zingiber officinale, an imported drug traditionally used in Afghanistan for a variety of diseases including flatulence, stomachache, vomiting, constipation, maldigestion, and loss of appetite, has been reported to have anti-inflammatory, antiemetic, antimicrobial, antioxidant, and cholagogic as well as many others effects. Studies show that it improves the exudation of saliva, gastric juices, and bile. Moreover, it raises the intestine tone and increases peristalsis. It is thought that the anti-inflammatory effect of the drug may be due to the inhibition of cyclooxygenase and 5-lipoxygenase leading to decreased leukotriene and prostaglandin synthesis. The drug is approved by Commission E for motion illness and dyspeptic problems and as an appetizer (PDR, 2007).

Curcuma longa and *C. aromatica*, two further imported drugs traditionally used in our study area for a wide range of gastrointestinal symptoms like maldigestion, flatulence, loss of appetite, liver disorders, constipation, and hemorrhoids, have been reported to contain EO and curcuminoids as the main active constituents. Also, hepatoprotective, anti-inflammatory, antimicrobial, antihyperlipidemic, and antitumor properties were reported. The antimicrobial effects of *Curcuma* are attributed in particular to the presence of sesquiterpene derivatives in the drug. Curcuma has been approved by Commission E for dyspeptic complaints and loss of appetite and is used for dyspeptic problems especially feelings of fullness after a meal and abdominal bloating due to gas (PDR, 2007).

Ferula spp. (Burbu) is an aromatic species belonging to the Apiaceae family with a great reputation among people in Afghanistan. Unfortunately, the exact species' names could not be

determined during these studies. It rarely grows in the high mountainous area of Parwan province (Ghorband valley) and is characterized by thick roots and pure yellow flowers in large compound umbel-like inflorescences and leaves 2-3-pinnate; leaf base inflated, ovate, leaf segments oval to ovate, and hispid. Fruit elliptic and with furrows. The root is a popular remedy in folkloric medicine of Afghanistan used for stomachache, flatulence, and diarrhea, as well as an antispasmodic in combination with other herbs such as fennel and Ajowan in the form of powder. In addition, the roots are used as fumigation against evil eyes.

Pleurotus eryngii, an edible mushroom, was reported by our informants to be used for constipation, stomachache, flatulence, and as anthelmintic. Literature has shown that mushrooms tall and their extracts have been considered a functional food because of their potential for the management of human sicknesses. The mushroom is rich in high-value proteins, vitamins, and minerals, and contains a very low amount of carbohydrates, and sugars. A review conducted by Patel, et al. (2012b) on the medicinal properties of *Pleurotus* species indicates the mushroom to have antimicrobial, antiviral, anti-inflammatory, anti-aging, hepatoprotective, antioxidant, hypoglycaemic, hypotensive, hypocholesterolemic, antilipidemic, and antitumor effects.

Koenigia coriaria is used as an antidiarrhoeal, for peptic ulcer, nausea, vomiting, maldigestion, gingivitis, and stomatitis in our study area. It has been reported to be used against diarrhea, wounds, inflammation, bleeding piles and hemorrhoids, allergic rashes, and skin infection in Uzbekistan (Egamberdieva, et al., 2013). However, modern scientific phytochemistry and pharmacological studies are lacking. Therefore, pharmacological studies must be done to verify the claimed folkloric applications.

Rumex crispus is used for constipation, emollient, and as a stomachic in our study area. It has been reported to contain anthraquinone derivatives, especially hydroxylated anthraquinones. Extracts and isolated compounds from this *Rumex* species demonstrated antioxidant, anti-inflammatory, antitumor, and antibacterial effects. Additionally, antiviral, antifungal, purgative, antiulcerogenic, hepatoprotective, antidiabetic, antifertility, anthelminthic, and antiplasmodial effects were reported by Vasas, et al. (2015).

Nigella sativa is used for flatulence, stomachache, laxative, and GI infection. It has been reported to have antiseptic, antifungal, anti-inflammatory, antispasmodic, digestive, and many other effects (Keusgen, et al., 2020).

Mangifera indica seed kernels are used as antidiarrhoeal and antidysenteric in the form of powder in our study area. It has been reported to contain a high amount of proteins (8.5%) and gallic acid. Traditionally it is used as an astringent, refrigerant, anthelmintic, constipating, hemostatic, healing of wounds, and uterine tonic. Therefore, it is widely used as an effective remedy for intestinal worms, chronic diarrhea, dysentery, hemorrhages, hemoptysis, hemorrhoids, vomiting, and ulcers. The antidiarrheal, antimicrobial, and hepatoprotective activities of the extracts of its seeds have been reported (Parvez, 2016; Amgad, et al., 2012; Kabuki, et al., 2000).

The *Elaeagnus angustifolia* fruit is traditionally used in digestive disorders such as dysentery, diarrhea, vomiting, and flatulence in our study area. Reportedly, it contains flavonoids, terpenoids, and cardiac glycosides. The antinociceptive and anti-inflammatory effects of fruit extracts and components were evaluated in animal experiments. The fruit is used against gastrointestinal disorders, diarrhea, different pains, and problems with heart and blood circulation. Additionally, antimicrobial, insecticidal, antioxidant, antiarthritic, wound healing, lipid-lowering, antimutagenic, antitumor, and gastroprotective properties have been reported (Ahmadiani, et al., 2000; Keusgen, et al., 2020).

Citrullus colocynthis, which is used for constipation and intestinal worms in our study area, was also reported to be used for medicinal purposes in other Asian as well as African traditional medicines. It is used for maldigestion, dysentery, gastroenteritis, colic pain, toothache, wounds, and diabetes. Literature reveals that the plant contains cucurbitacins, alkaloids, glycosides, flavonoids, and phenolic acids. The antimicrobial, anti-inflammatory, anticancer, antioxidant, and hypolipidemic activities have been evaluated in modern pharmacological experiments (Hussain, et al., 2014).

Solanum nigrum, which is used in different gastrointestinal affections such as stomachache, constipation, diarrhea, gastritis, and toothache, has been reported to contain a high amount of glycoalkaloids such as solanine, solanidine, in addition to steroidal alkaloids like solasodine, steroidal saponins known as nigrumins, and different organic acids. Literature reveals that the plant has hepatoprotective, anti-tumor, cytostatic, anti-convulsant, anti-ulcerogenic, and anti-inflammatory effects. In animal tests, a local anesthetic effect, sleep prolongation, and significant inhibitory effect on the occurrence of acetylsalicylic acid-induced stomach ulcers have been reported. The effect is ascribed to the inhibition of pepsin and hydrochloric acid exudation (Atanu, et al., 2011; PDR, 2007).

Terminalia chebula, an imported drug, is traditionally used in our study area for constipation, abdominal pain, gluttony, and flatulence. It has been reported to have a high hydrolyzable tannin content consisting of chebulic acid and D-galloyl glucose. Antibacterial, cholesterol-lowering, and cardiotonic activities have been reported in modern pharmacological experiments. It has a great reputation in India and is recommended for many diseases. A multiple combination preparation, which is known as Trifala, consists of equal parts of fruits of *T. chebula,* and *T. bellirica* (Gaertn.) Roxb. and *Phyllanthus emblica* L. (Phyllanthaceae) (*Emblica officinalis*), is very popular as purgative (PDR, 2007; Qadry, 2009).

Cassia fistula, another imported drug traditionally used in our study area for a wide array of symptoms of gastrointestinal disorders, particularly for stomachache, and constipation in infants, has been reported to have a laxative effect due to the presence of anthracene derivatives. Furthermore, the antimicrobial and antiviral effects of a fruit preparation were reported using in vitro studies. In India, it is used for flatulence, constipation, fever, anorexia, gout, jaundice, itching, and dermal disorders. However, except for constipation, the efficacy of these applications has not been proven (PDR, 2007).

Senna alexandrina (*Cassia senna*) is also an imported drug in Afghanistan. It is traditionally applied in our study area against constipation and gastrointestinal problems. It has been reported to contain anthracene derivatives with sennosides as the main components. Its laxative effect is well documented in laboratory and clinical trials. It is well understood that the drug inhibits the absorption of water and electrolyte from the colon, leading to the increased volume and pressure of the intestinal matter. This excites colon motility and helps the evacuation of the bowel (PDR, 2007).

4.3.5 Urinary and gynecological effects

The aerial parts of *Urtica dioica* are used against urinary affections such as gonorrhea, kidney and bladder disorders, diuretic, and prostatic hyperplasia in our study area. They have been reported to have anti-inflammatory, analgesic, and diuretic actions. In animal experiments, local anesthetic and analgesic effects have been observed. It has been reported that the main components of pressed juice of the plant are scopoletin, β-sitosterol, and caffeoyl malic acid which has a diuretic action. The leaf extract inhibited the cyclooxygenase-derived reactions which may account for the anti-inflammatory effects of this plant. The root has been known to rise urine volume and urinary flow, and reduce residual urine. It has been reported that the aqueous extract of the root is very effective in the treatment of benign prostatic hyperplasia

(BPH). The extract inhibited the binding of sex hormone-binding globulin (SHBG) to its receptor on human prostatic membranes in a dose-related manner. An antirheumatic and anti-arthritic effect has also been reported (PDR, 2007).

Astragalus bezudensis root and leaves have traditionally been used against urinary disorders, such as kidney stones, nephritis, and gonorrhea in our study area. It has been reported that *Astragalus* species have antiviral, antioxidant, cardiotonic, gastrointestinal, hepatoprotective, fibrinolytic, memory improvement, and immune-stimulating effects. The herb has been used for respiratory infections, immune depression, cancer, heart failure, viral infections, liver disease, and kidney disease, and also as a diuretic in different traditional medicines (PDR, 2007).

Trigonella foenum-graecum has been traditionally used for gynecological problems, as an aphrodisiac and lactogenic. It has been reported that the seed extract is used in Ayurveda medicine as a cardiotonic, diuretic, anti-inflammatory, and lactation-promoting agent. Its main saponin is known as diosgenin, which is a precursor of estrogen and might help in managing menopause (Qadry, 2009).

It has been reported that the main active principles of Juglans *regia* fruit septa are tannins and juglone. The astringent effect is attributed to tannins, while the fungistatic activity is caused by juglone content and essential oil (PDR, 2007).

Nepeta juncea infusion and powdering have traditionally been used for gynecological problems such as amenorrhea, menstruation, infertility, abortion, and gonorrhea. This plant has been reported to contain EO with monoterpenes such as 1,8-Cineole, β-Pinene, Terpinen-4-ol, and α-Terpineol, which possess antimicrobial activities (Sharifi-Rad, et al., 2020).

Elymus repens decoction has traditionally been used to remove kidney stones, and bladder stones as well as for the treatment of further urinary problems. Reportedly, it has been used as an anti-inflammatory agent for diseases of the urinary tract and for the prevention of kidney stones, as well as for cystitis, kidney stones, gout, rheumatic pain, and chronic skin disorders. Its antimicrobial effect has been demonstrated in modern studies, and the drug is approved by Commission E for urinary tract infections as well as for kidney and bladder stones (PDR, 2007).

Zea mays stigmata have traditionally been used in the form of infusion to expel stones from the kidney as well as for pain, urinary tract inflammation, and infections. It has been reported to

have excellent antioxidant, antibacterial, anti-inflammatory, and diuretic activities (Hasanudin, et al., 2012; Keusgen, et al., 2020).

Prunus cerasus fruit petioles, traditionally used against kidney disorders, have been reported to exhibit anti-inflammatory and analgesic effects. Moreover, it reduces the level of uric acid and triggers blood circulation, blood sugar level, and metabolic functions (Keusgen, et al., 2020).

Vitis vinifera has been reported to be beneficial for treating symptoms of premenstrual syndrome. Also, in Indian medicine, it is used for gonorrhea, dysuria, scabies, skin diseases, headache, hemorrhoids, and vomiting (PDR, 2007).

Borago officinalis has been reported to be used as an anti-inflammatory agent for kidney and bladder disorders, as an astringent, and to treat rheumatism (PDR, 2007).

Convolvulus arvensis root extracts were tested in rats using furosemide as a standard diuretic drug. The water and ethanolic extracts of the root increased urine output in a time-dependent manner. Also, the extracts significantly affected electrolyte excretion. The ethanolic extract of the plant showed antibacterial activity against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, and *Klebsiella pneumoniae* (Al-Snafi, 2016a).

Tribulus terrestris fruits and herbs are traditionally used in decoction form for the treatment of urinary disorders such as kidney stones, cystitis, and gonorrhea, and as an aphrodisiac. It has been reported to be used in modern phytotherapy for kidney disorders. In addition, it was reported that it improves sexual function and that it features anti-inflammatory, antibiotic, and antioxidant with many other properties were reported (Keusgen, et al., 2020).

4.3.6 Muscle-skeletal and dermal effects

The anti-inflammatory effect of *Matricaria chamomilla* is well documented. Its non-volatile compound chamazulene shows an anti-inflammatory effect via inhibition of leukotriene B4 formation. Apigenin effectively blocks intercellular adhesion molecule-1 upregulation and leukocyte adhesion in response to cytokines. This activity is caused by a mechanism unrelated to free radical scavenging or leukocyte formation. The herb demonstrated antibacterial and drying effects upon weeping wound areas, which promotes healing. Also, chamomile oil demonstrated antimicrobial activity against some skin pathogens such as *Staphylococcus* and *Candida* species. In clinical trials, the efficacy of chamomile cream was compared to steroidal and non-steroidal dermatologic creams for the treatment of eczematous disease. The

chamomile cream was slightly less effective than 0.25% hydrocortisone and superior to 5% bufexarnac and 0.75% fluocortin butyl ester. In modern phytotherapy, the drug is used for the inflammations of dermal and mucosal membranes, gingivitis, wounds and burns, and anogenital inflammation (PDR, 2007).

Colchicum autumnale has been traditionally used as an antigout, for pain, arthritis, and rheumatism. It has been reported to inhibit mitosis and block the immigration and the autolysis of phagocytes in inflammatory procedures, thus leading to an anti-inflammatory effect (PDR, 2007).

Aqueous and methanol extracts of *Berberis sp.* such as *B. lycium* Royle were studied in animal experiments for wound healing activity. Both extracts improved the area of epithelialization and also exhibited an increase in breaking strength. In the hydro extract-treated group, moderate collagen deposition, macrophages and fibroblasts were found, while an important increase in collagen deposition with smaller macrophages and fibroblasts was observed in the methanolic extract-treated group. Furthermore, a remarkable rise in the dry weight and in the hydroxyproline content of granulation tissue was observed (Asif, et al., 2007).

Trichodesma incanum is used as a wound healing, and anti-inflammatory, as well as for dermal disorders in our study area. It has been reported that its leaves are used to treat dermal disorders, particularly for wound healing in different folkloric medicines. Internal usage is harmful and forbidden. Its anti-inflammatory and analgesic activities have been reported to supports traditional uses for skin diseases in our study area. The plant is also toxic for livestock if fodder is contaminated with parts of it (Keusgen, et al., 2020).

Anti-allergic inflammatory activity, antibacterial, and antioxidant effects of *Prunus persica* have been reported. The fruit has a high nutritive value making it important for human beings (Kant, et al., 2018).

It has been reported that *Equisetum arvense* contains flavonoids such as apigenin, caffeic acid esters, silicic acid, and pyridine alkaloids. It is used for brittle fingernails and the loss of hair, for rheumatic diseases, gout, poorly healing wounds and ulcers, swelling, and fractures as well as for frostbite in different folkloric medicines. In modern phytotherapy, it is externally used as supportive treatment for poorly healing wounds and was approved by Commission E for wounds and burns (PDR, 2007).

The folkloric utilization of *Fumaria officinalis* herb for dermal disorders, rheumatism, arthritis, and infections have been reported. Moreover, it is used for chronic, itching eczema resulting from liver disease (PDR, 2007). In modern pharmacological experiments, *F. parviflora* Lam. demonstrated anti-inflammatory, anti-eczema, antinociceptive, and antibacterial activities. An alcoholic extract of the plant reduces the eczema area and severity index score when compared to vehicle-treated and untreated groups. *Fumaria parviflora* seems to be an effective agent for the treatment of dermatitis (Kumar, et al., 2017).

Marrubium anisodon, used as an anti-inflammatory, for wound healing as well as for the treatment of dermatitis, has been reported to contain essential oil, flavonoids, the alkaloid stachydrine, resins, mucilage, diterpenoids (vulgarol and marrubiin), tannins, phenols, coumarins, and saponins. Moreover, antinociceptive, and antimicrobial activities have been reported (Keusgen, et al., 2020).

Nepeta juncea is used as an analgesic against backache and muscular disorders and has been reported to contain high content of phenolic, flavonoid, anthocyanin, and tannin. Antioxidant, cytotoxic, antifungal, and antibacterial activities of the plant extract were reported (Sharifi-Rad, et al., 2020).

Nepeta laevigata is used against general body aches, backache, muscle contraction, and toothache. It has been reported to possess EO (0.8%) with germacrene D, β-citronellol, and α-bisabolol oxide B as the major components. Flavonoids and other phenolic compounds are to be expected. In addition, antinociceptive, antimicrobial, and anti-inflammatory effects of *Nepeta* species have been reported (Salehi, et al., 2018).

The extracted EO from the aerial parts of *Salvia yangii* B.T.Drew (*Perovskia atriplicifolia)* is rich in β-thujone and 1,8-cineole. The oil extracted from cultivated plants was found to contain mainly camphor. The EO has antimicrobial activity (Erdemgil, et al., 2007) and therefore, may be considered a potential source of antimicrobial medicine for dermal wounds.

Salvia rhytidea has been reported to contain EO with spathulenol, pulegone, sabinene, and copaene as marker components. Antimicrobial, antifungal, antipyretic, and analgesic effects have been reported (Keusgen, et al., 2020).

Cinnamomum verum, an imported drug in the traditional medicine of Afghanistan, has been shown to have antimicrobial, antiparasitic, antioxidant, and free radical scavenging properties, suggesting beneficial traditional uses of the drug in our study area (Ranasinghe, et al., 2013).

Malva neglecta is used as an anti-inflammatory, for swelling, moist wounds, and dermal disorders. It has been reported to have alkaloids, tannins, saponins, hydroxycinnamic acids, flavonoids, flavonols, proanthocyanidins, anthocyanins, and organic acids. Antibacterial, anti-inflammatory, antioxidant, and anti-ulcerogenic effects of the plant have been reported, which supports the traditional uses of the plant in our study area (Al-Snafi, 2019).

Olea europaea oil is externally applied over fractured limbs as well as against joint pain and rheumatism in our study area. It has been reported to have a remarkable anti-inflammatory effect due to oleocanthal, which has an amazingly similar profile to ibuprofen. Moreover, the analgesic and antinociceptive effects of the oil were reported in modern pharmacological animal models (Hashmi, et al., 2015).

Plantago major leaves contain phenylethanoids such as verbascoside, cistanoside F, lavandulifolioside, plantamajoside, and isoacteoside, in addition, the iridoid glycosides aucubin, catalpol, asperuloside, mucilage, and tannins, while seeds contain mainly mucilage. Aucubin has antimicrobial effects and is therefore used against dermal infections. An anti-inflammatory effect of the drug is also reported (Keusgen, et al., 2020). Mucilage neutralizes irritation and, therefore, can be used as a soothing agent, especially for dermal disorders.

Malus domestica fruit extracts have shown anti-inflammatory and antimicrobial properties. The water and alcohol extracts of the plant turned out to be effective against gram-positive and gram-negative bacteria like *B. subtilis*, *S. aureus*, *E. coli*, and *P. aeruginosa* (Patel, et al., 2012a).

Salix spp. has been reported to have antipyretic, analgesic, and anti-inflammatory effects. The efficacy of the drug is mainly attributed to the content of salicin. Salicin glycosides convert to salicin, the precursor of salicylic acid, where the antipyretic, antiphlogistic, and analgesic effects are well known. Commission E approved the drug for the treatment of rheumatism and pain. The drug is useful in diseases accompanied by fever, rheumatic ailments, headaches, and pain caused by inflammation (PDR, 2007).

Verbascum thapsus, which is used as an anti-inflammatory, against acne, arthritis, and bone fracture in our study area, has been reported to have anti-inflammatory, antioxidant, anticancer, antimicrobial, antiviral, and wound healing properties. The wound-healing effect of the plant was tested in a rabbit tail with a topical application of herbal extract. It increased the formation of the epidermis and the deposition of connective tissue suggesting a good healing effect on regeneration (Riaza, et al., 2013).

Solanum nigrum, used against intestinal and skin disorders, contains solanine and related alkaloids that are poisonous. All green parts are more or less toxic (depending on variety). Anti-inflammatory, antinociceptive, anti-ulcerogenic, and antipyretic activities have been reported (Potawale, et al., 2008).

Curcuma longa, an imported drug in the traditional medicine of Afghanistan, has been reported to have antibacterial activity and the capacity to restore the effectiveness of β-lactamase against MRSA and to inhibit the MRSA invasion of human mucosal fibroblasts (Elfahmi, et al., 2014). Therefore, it may be useful for the traditional treatment of bone fracture and bruise in our study area.

Juglans regia fruit cortex (walnut hulls) is used for dermal diseases such as Leishmaniasis and as a hair tonic. It has been reported to have an astringent and fungistatic effect. The main active principles are tannins and juglone. The astringent effect is due to tannins while the antifungal effect is caused by juglone content and EO. It is the application that has been approved for inflammation of the skin and excessive perspiration (PDR, 2007).

According to the citation of our informants, *Arnebia afghanica* should act as an antispasmodic, pain reliever, sedative, and narcotic; however, there are no studies available to validate such activities.

4.3.7 Antimicrobial, antipyretic, and heat-related illness effects

Allium cepa, an anti-infectious drug in our study area, has been reported to have an antimicrobial effect and to be effective against *Bacillus subtilis*, *Salmonella typhi*, *Pseudomonas aeruginosa*, and *Escherichia coli*. It is well known that thiosulphinates are responsible for the antibacterial activity of onions. The drug is approved by Commission E for its tendency to heal infections, fevers, and the common cold. Also, the antibacterial, antifungal, and antiviral effects of *Allium sativum* have been well-documented. The antimicrobial activity of the plant is attributed to the alliin content in the native drug, generating allicin after cell disruption. Literature reveals that garlic and its bioactive sulfur compounds act as natural antibiotics with a broad spectrum of activity against many genera of bacteria, fungi, and viruses. Clinical trials showed that garlic was effective in the prevention of the common cold, in reducing recovery time and symptom duration in a randomized double-blind, placebo-controlled study (PDR, 2007).

Heracleum lehmannianum leaves are traditionally used as antipyretic and for heat-related disorders. Furthermore, its root is used for typhoid fever in our study area. Literature reveals that its leaves and roots contain furanocoumarins, oxy-coumarins, flavonoids, and saponins. The fruit contains EO with hexyl butyrate, octyl acetate, and octyl butanoate as marker compounds, and EO from leaves mainly contains anethol. Also, antiviral effects have been reported (Keusgen, et al., 2020; Karimi & ITO, 2012).

Artemisia absinthium has been reported to show an antipyretic effect. In animal experiments, the antipyretic effect of different fractions of the drug has been observed when administered via the esophageal probe. Also, the antimalarial effects of the drug have been validated in vitro as well as in clinical trials (more for *A. annua*). The plant has been approved by Commission E for loss of appetite as well as for dyspeptic complaints and dyskinesia of the bile ducts (PDR, 2007).

Cichorium intybus is used for typhoid, antipyretic, malaria, and sunstroke. Hexane and ethyl acetate root extracts of the plant exhibit noticeable antibacterial activity against Gram-positive and Gram-negative bacteria by in vitro agar well diffusion method. In addition, the antimalarial effect of the root was reported. The bitter compounds isolated from aqueous extracts of the plant, namely lactucin, lactucopicrin, and the guaianolide sesquiterpenes, seem to be responsible for the antimalarial activity (Al-Snafi, 2016b).

The seed extracts of *Descurainia sophia* have been shown to possess antipyretic, anti-inflammatory, and antibacterial activities. The phenolic compounds were concluded to be responsible for anti-inflammatory, and antipyretic activities. Also, the hydroalcoholic extract of the plant exhibits therapeutic effects on mice infected with *Himeonolepis nana* (Nimrouzi & Zarshenas, 2016; Aghaabbasi, et al., 2014).

Citrullus colocynthis, a broad-spectrum antimicrobial agent in our study area, has been reported to have antibacterial and anticandidal activities. Fruit water extract shows antimicrobial activity against *Candida albicans* and *C. glabrata*, as well as against *Escherichia coli* and *Pseudomonas aeruginosa* (Marzouk, et al., 2009).

Plantago lanceolata liquid extract and the pressed juice of fresh herbs have been proven for antibacterial activity. The antibacterial effect has been attributed to hydrolyzed acubin (aucubigenin) and an antimicrobial saponin in the drug. It is approved by Commission E for the treatment of common colds, cough/bronchitis, fevers and colds, and inflammation of the mouth and pharynx (PDR, 2007).

Portulaca oleracea, a general antimicrobial remedy in our study area, has been reported to have antifungal and antibacterial activity against some strains of *Trichophyton* spp. as well as a significant antibacterial effect against *Staphylococcus aureus*, *Escherichia coli*, *Neisseria gonorrhoeae*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Streptococcus* (Syed, et al., 2016).

Prunus persica leaves, a traditional remedy for infectious wounds in livestock, have been reported to contain saponin, tannin, phlobatannin, and flavonoid. Ethanolic leaf extract was tested for antibacterial activity against Gram-positive bacterial strains and Gram-negative bacteria. The extract exhibits a significant antibacterial effect against both of the above-mentioned bacteria groups (Edrah, et al., 2015).

Salix alba leaves and rootlets, a general febrifuge and antipyretic for typhoid and malarial fever as well as for sunstroke in our study area, have been reported to contain glycosides and esters yielding salicylic acid. The efficacy of the drug mainly depends on the proportion of salicin present in the plant. Its antipyretic, analgesic, and anti-inflammatory effects have been well documented confirming the traditional claims (PDR, 2007).

Solanum nigrum, another traditional anti-fever as well as a remedy for infectious wounds in our study area, has been evaluated for antimicrobial activity. The methanolic extract of powdered fruit material exhibits significant activity against Gram-positive bacteria and Gram-negative bacteria as well as against three fungi strains (Abbas, et al., 2014). Based on the citation of our informant, the fruit should work as an antifever; however, there are no studies available. The lipid-soluble extract of *S. nigrum* leaves has been reported to show an antipyretic effect (Zakaria, et al., 2006).

Vitis vinifera leaves, a common antipyretic agent in our study area, have been reported to contain polyphenols and flavonoids with resveratrol and quercetin constituting the major polyphenol compounds. Its hydroalcoholic extract exhibits antipyretic analgesic and anti-inflammatory effects which support the claim for the traditional use of leaves of the plant in the treatment of sunstroke (Aoueya, et al., 2016).

Peganum harmala, an antimicrobial agent in our study area, has been reported to contain alkaloids, including β-carbolines, such as harmine, harmaline, harmalol, and harman. Different seed extracts and their pure β-carboline alkaloids have been examined on multiple antibiotic-resistant bacteria and certain protozoa. All the extracts and alkaloids inhibit the growth of all tested bacteria and protozoa (Marwat & Rehman, 2011). But the plant elicits various adverse

effects such as neurosensorial symptoms, visual hallucination, bradycardia, hypotension, agitation, tremors, ataxia, abortion, and vomiting effects, so it has to be used with caution. Furthermore, it has abortive and mutagenic activities. Therefore, all parts of the plant are contraindicated during pregnancy (Keusgen, et al., 2020).

4.3.8 Anti-diabetic effects

Quite a few largely used antidiabetic medicinal plants are used in our study area; however, only a couple of these plants shall be discussed briefly here.

Artemisia absinthium, an antidiabetic agent in our study area has been reported to contain EO and amaroids. The antidiabetic efficacy of the plant has been evaluated in animal experiments as well as in diabetic patients. The plant exhibited a dose-dependent hypoglycaemic effect in the diabetic individual, which is thought to occur through insulin-mimetic action (Li, et al., 2015) supporting the claimed traditional antidiabetic use. Moreover, the antipyretic, antibacterial, and antimalarial effects of the plant are well documented (PDR, 2007). According to our informant, the *Centaurea pulchella* flower should work as an antidiabetic agent; but, there are no studies available to confirm this claim. However, literature reveals that the genus *Centaurea* contains sesquiterpene lactones, flavonoids, and lignans (Khammar & Djeddi, 2012). Therefore, it is vital to provide a rational basis for the validation of its potential traditional therapeutic claim with more investigations. *Citrullus colocynthis*, an antidiabetic agent in our study area, has been reported to have a blood sugar-lowering effect in diabetic humans. The hypoglycaemic action of the plant was also reported in hyperglycaemic animal models under the effect of antihyperglycemic drugs such as streptozocin and alloxan (Li, et al., 2015). *Trigonella foenum graceum,* a common spice, is used as an antidiabetic agent in our study area and has been reported to have an antihyperglycemic effect. Its hypoglycaemic effects have been verified in experimentally induced diabetic animals as well as in human volunteers. In clinical studies, the administration of seed powder of this plant in Type 1 diabetic patients for 10 days significantly lowered the fasting blood sugar. Also, it has a hypolipidemic effect which is attributed to the saponin fraction (PDR, 2007). *Hordeum vulgare* is an annual cultivated cereal of the Poaceae family that may be sown either as a winter or a spring crop. Its flour is used as a food in the form of bread in Afghanistan, commonly taken orally by diabetic patients, and a decoction of the dry seed is used as a diuretic for kidney problems in our study area. It has been reported to have hypoglycaemic, hypocholesterolemic, and diuretic activities (Ross, 2005).

4.4 Special aspects

Traditional medicine in Afghanistan has no reputation like that developed in other countries such as India and China. Indian and Unani Medicine has been developed in neighboring countries. They influenced plant usage in Afghanistan and the philosophy beyond traditional medicine in Afghanistan. Therefore, we found many imported medicinal plants from India and Pakistan which are used in our study area. Furthermore, it was found that many poisonous plants such as *Citrullus colocynthis*, *Peganum harmala*, *Nerium oleander*, *Trichodesma incanum*, and so on, are frequently used by people for various illnesses, because of the common belief that plants, in general, are safe and harmless ("green medicine"). However, many cases regarding the toxicity of medicinal plants have been reported. Even the use of medicinal plants at a precise dosage may produce some side effects and the safety and effectiveness of plants cannot be guaranteed. The following paragraphs describe some of these plants as examples.

Literature reveals that *Citrullus colocynthis* (fruits) is a strong irritant with a painful action on mucous membranes. It causes vomiting, dysentery, colic, and kidney irritation and then increases the diuresis that progresses to anuria. Lethal dosages are beginning at 2 g of fruit material and lead to convulsions, paralysis, and, cardiovascular collapse. The most important side effects reported for the potentially psychotropic plant *Peganum harmala* (herb including seeds) are neurosensorial symptoms, visual hallucination, bradycardia, hypotension, agitation, tremors, ataxia, abortion, and vomiting. Even *Zingiber officinale* with a wide array of traditional uses in our study area has been reported to induce heartburn and act as a stomach irritant if taken more than 6 g of the crude rhizome. The inhalation of its dust could induce IgE-mediated allergy (Elfahmi, et al., 2014). *Rumex crispus* (herb), with wide traditional use in our study area, has been reported to have destructive action upon the digestive tract due to oxalic acid. Oxalic acid reacts with the calcium in plasma and causes hypocalcemia. Moreover, produced insoluble calcium oxalate precipitate occurs in many organs like kidneys, heart, blood vessels, liver, and lungs. Consuming plants containing high amounts of oxalate can weaken iron absorption, too. Therefore, patients with kidney stones, rheumatism, arthritis, gout, or hyperacidity should avoid the intake of such plants, which may worsen their conditions. The lethal dose of oxalic acid for an adult is 15–30 g; even doses less than 5 g can be fatal (Vasas, et al., 2015). In addition, herbal remedies may interact with conventional medication. Therefore, users should consult a physician to avoid such adverse effects. It should be reminded that the adverse effects of medicinal plants like conventional drugs depend on the crude drug and its amount, the ages of patients, their genetic constitution, associated diseases, and co-

medication. On the other hand, adulteration, substitution, and contamination of crude drugs are big concerns. A study carried out by Ali, et al. (2005) reported the presence of aflatoxins in plant products (due to improper drying) that have carcinogenic, teratogenic, and mutagenic effects. Also, Elfahmi, et al. (2014) reported a very high level of transaminases and lactate dehydrogenase in a patient after the use of *Morinda citrifolia* L.

As it is highlighted in Table 2, there is an imbalance between male and female participants in this study, while it is known that tradition is kept and preserved mostly by females. That can be the flawed aspect and blame of this thesis. Most researchers who aim at recognizing and documenting local knowledge wish to include both male and female participants. However, in countries like Afghanistan, where the gender aspect is imbalanced and females are often less educated and are under cultural restraints even in urban settlements, the maintenance of equal gender in field research is hardly manageable.

5 CONCLUSIONS

This study highlights that the flora of Kabul and Parwan provinces provides a large number of medicinal plant species. Based on the knowledge of our informants, a total of 270 medicinal plant species were recorded. These medicinal plants belong to 76 different families which are mainly represented by Asteraceae, Fabaceae, Lamiaceae, Apiaceae, Rosaceae, Solanaceae, Brassicaceae, and Poaceae. Most of the recorded plants are herbs, and aerial parts are the most popular plant part used. Infusion, decoction, powder, fresh consumption, and maceration are the most common methods of preparation. A high number of plant species are used for managing internal disorders, gastrointestinal, muscle-skeletal, cardiovascular, urinary, respiratory, infectious, nervous, and blood sugar problems. Furthermore, people also use medicinal plants as fire fuel and sell them in the local markets for earning their livelihood. Few plants such as *Amygdalus communis*, *Prunus cerasus*, *P. persica*, *Malus domestica*, *Juglans regia*, and *Vitis vinifera* possess the potential for economic exploitation. The majority of the recorded plant species are obtained from wild sources and some of these valuable medicinal plants like *Arnebia afghanica*, *Artemisia* sp., *Astragalus* sp., *Cousinia* sp., *Ephedra* sp., and *Levisticum officinale* are constantly and indiscriminately overharvesting. These valuable medicinal plants are getting very rare as confirmed by elder inhabitants and observed during the field visits. If the present trend continues, it will not be too long before some of them faced local extinctions. It is, therefore, very crucial that awareness should be done so that the community is integrated into the conservation and sustainable use of medicinal plants. Out of

all the plants we reported, approximately 31% were very frequently used, recorded more than 10 times by informants; 21% were frequently used, recorded 5-10 times, and 47% were less frequently used, recorded 4 times or less. Furthermore, out of the top 87 popular medicinal plants in our study area, approximately 91.6% were native and only 9.4% were imported medicinal plants. In addition, among the top 87 medicinal plant species, we documented some species that were novel and have no previous literature record. This work was also in line with earlier related works and reveal that ethnobotanical uses of plants were more or less the same. There were certain differences in the number of species reported and the number of plant species put to ethnobotanical uses in studies conducted in Afghanistan in comparison with the present study, which accounted for the difference in the area of research because previous studies only focused on market survey and did not cover rural and local communities. Therefore, this type of study should be extended to other parts of Afghanistan to enable the achievement of a full compilation of the inventory of medicinal plants. Remarkably, most of the plants used traditionally in our study area can be rationalized, especially, since we found that more than half (54%) of the reported medicinal plants have monographs in official reference taken into consideration. It also shows the consistency of traditional use and rational use in the study area. Most of the group-1, (very frequently used plant species) have been well documented in the literature, mostly based on in vitro studies, supporting the reported traditional uses claimed by our informants. Therefore, these plants can be proved to be useful for clinical studies and the development of commercial phytomedicine. In addition, this study could greatly improve the livelihood of the local community and may be used to further support plant conservation by carefully managed collection regimes and/or by taking the most requested species into cultivation.

In summary, the documentation of plants used in the area can preserve valuable traditional knowledge for both future generations and other communities as well as for resource management and conservation purposes. It is important to highlight that 90 out of 270 species have not been reported from Afghanistan and are reported here for the first time. It is important to highlight that the elder population (above 40 ages) has more information compared to the young generation and by passing away the elder people before handing out their knowledge, the possibility of a loss of traditional knowledge about useful medicinal plants is conceivable. This study is the first stage in pharmaceutical bio-prospection, and these data may be the basis point for further research expected to obtain products for therapeutical uses.

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7 APPENDIX

7.1 The questionnaire used for the recording data

1) Ordering No.; Sheet No. ……..
2) Date of Interview……
3) Place of Interview…….
4) Interviewer……

Remark: Ordering Number should include the number of the province and/or district. This has to be defined between partners

Interviewed Person

5) Name and surname of the participant; *alternatively*: description of the meeting of people (number of people, age distribution, sex, etc.), which were interviewed
6) Age of the participant
7) sex of the participant
8) Address of the participant
9) Duration of residence of the participant
10) The educational level of the participant
11) Occupation (profession) of the participant

Plant Details

12) What is the local name of the plant used?
13) Is the plant native or imported?
14) Which parts of the plant do you use? (Root, flower, leaves, whole plant. etc.)

For each used plant part (1, first plant part):

15) For the treatment of which diseases do you use the plant? Alternatively: For which food/dish/drink or further purpose do you use the plant?

Useful plants are for the following purposes*:*

a) food
b) medicinal
c) cosmetics
d) religious
e) decorative
f) provide to other people
g) Others (what kind?) _____

Application of plant parts (has to be repeated if different plant parts were used)

16) How and when do you use the plant?
17) How do you prepare the plant for use (fresh – dried – boiled – as tee – tincture – others)?
18) Approximately what dose do you use (for medicinal plants)?
19) Has traditional use changed during the last decades or the last generation? Do you know an interesting story about this (*e.g.*, the now collected plant is a replacement for another one, which has been over-harvested two decades ago)?

Further aspects:

20) Is the described medication used in combination with other herbs or foods or drinks or something else?
21) Is the given information coming from your own experience or did someone introduce the use of this plant to you (*e.g.*, information obtained from mother grandmother, local healer, etc. If details were given, please describe)
22) Do you need a prescription from a healer or a physician for the described plant?
23) Do you use the described medication personally and/or for your family and relatives?
24) Do you collect the described plant for personal usage or do you sell or give it to further persons? To you trade with medicinal plants.
25) When do you collect the plant (the month of the year)?
26) How long do you can store the collected plant material or prepare it out of it?
27) Further remarks:

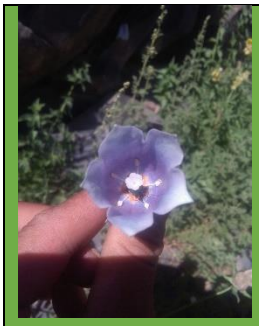
……
……
……
……
……

7.2 Photographs of plant species used in the study area

		
Achillea wilhelmsii	*Acorus calamus*	*Adiantum capillus-veneris*
		
Polygonum sp.	*Alhagi pseudalhagi*	*Alhagi pseudalhagi*
		
Allium cepa L.	*Allium mirum*	*Allium*
		
Alceae rosea	*Alceae rosea*	*Amaranthus caudatus*

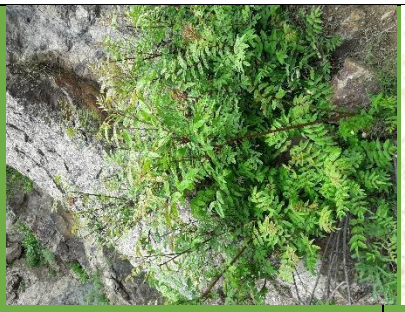
		
Prunus koelzii	*Amygdalus communis var. amara*	*A. communis var. dulcis*
		
Arctium lappa	*Arctium lappa*	*Arctium lappa*
		
Arnebia afghanica	*Artemisia absinthium*	*Artemisia sp.*
		
Artemisia sp.	*Artemisia sp.*	*Asparagus*

		
Berberis integerrima	*Borago officinalis*	*Cannabis sativa*
		
Capparis spinosa	*Centaurea pulchella*	*Chamaecrista absus*
		
Cercis siliquastrum	*Cercis siliquastrum*	*Chrysanthemum sp.*
		
Cirsium vulgare	*Colutea paulsenii*	*Convolvulus arvensis*

		
Codonopsis clematidea	*Corydalis gortschakovii*	*Corydalis gortschakovii*
		 
Cousinia umbrosa	*Cousinia umbrosa*	*Cousinia buphthalmoides*
		
C. buphthalmoides	*Crataegus songarica*	*Crataegus songarica*
		
Crocus sativus	*Cucurbita moschata*	*Cydonia oblonga*

		
Datura stramonium	*Descurainia sophia*	*Digitalis purpurea*
		
Dionysia sp.	*Elaeagnus angustifolia*	*Entada rheedii*
		
Ephedra gerardiana	*Ephedra gerardiana*	*Equisetum* sp.
		
Eremurus	*Eremurus persicus*	*E. stenophyllus*

		
Eucalyptus globulus	*Euphorbia granulata*	*Euphorbia granulata*
		
Euphorbia megalocarpa	*Fritillaria imperialis*	*Ferula diversivittata*
		
Ferula narthex	*Ferula ovina*	*Ferula ovina*
		
Ferula sp.	*Ferula sp.*	*Ferula sp.*

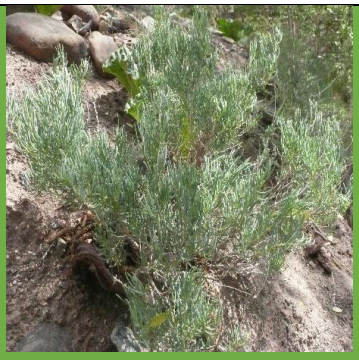
		
Filipendula vestita	*Fumaria officinalis*	*Fumaria officinalis*
		
Glaucium flavum	*Glaucium flavum*	*Glycyrrhiza glabra*
		
Glycyrrhiza glabra	*Helianthus annuus*	*Helianthus petiolaris*
		
Hymenocrater sessilifolius	*Heracleum lehmannianum*	*Hyoscyamus niger*

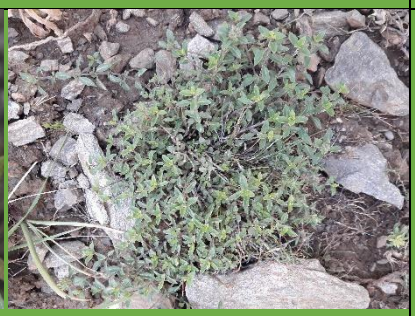
		
Levisticum officinale	*Linum usitatissimum*	*Malus domestica*
		
Malva neglecta	*Marrubium anisodon*	*Marrubium anisodon*
		
Mentha longifolia	*Morus alba*	*Morus nigra*
		
Myristica fragrans	*Veronica sp.*	*Nepeta bracteata*

		
Nepeta juncea	*Nepeta glutinosa*	*Hymenocrater sessilifolius*
		
Nicotiana rustica	*Nicotiana rustica*	*Nigella sativa*
		
Ocimum basilicum	*Origanum vulgare*	*Origanum vulgare*
		
Papaver dubium	*Papaver pavoninum*	*Papaver somniferum*

		
Pistacia vera	*Pimpinella sp.*	*Pimpinella sp.*
		
Plantago lanceolata	*Plantago major*	*Plantago sp.*
		
Koenigia coriaria	*Prangos pabularia*	*Primula pamirica*
		
Prunella vulgaris	*Prunus cerasus*	*Prunus microcarpa*

		
Prunus persica	*Pyrus communis*	*Quercus sp.*
		
Ranunculus olgae	*Ranunculus olgae*	*Rheum ribes*
		
Rosa sp.	*Rosa beggeriana*	*Rosa garden*
		
Rubus caeslus	*Rumex crispus*	*Salvia*

		
Saponaria griffithiana	*Scorzonera paradoxa*	*Seidlitzia rosmarinus*
		
Senecio glaucus	*Solanum nigrum*	*Solanum tuberosum*
		
Sophora alopecuroides	*Phlomidoschema parviflora*	*Tamarix ramossissima*
		
Taraxacum officinale	*Tribulus terrestris*	*Tribulus terrestris*

		
Trichodesm incanum	*Trigonella foenum-graecum*	*Tulipa linifolia*
		
perhaps Arctium sp.	*Urtica dioica*	*Verbascum thapsus*
		
Verbena officinalis	*Verbena officinalis*	*Zingiber officinale*
		
Ziziphora clinopodioides		*Ziziphora tenuior*

7.3 Curriculum Vita

First Name: Abdul Ghani **Last name**: Karimi **Sex**: Male

Nationality: Afghan **Date of Birth**: 06. 03. 1977 **Place of Birth**: Parwan, Afghanistan.

WORK EXPERIENCES

Head Department of Pharmacognosy
Kabul University [Jul 8, 2019–Apr 09, 2022] Kabul, Afghanistan.
Main tasks: leading and managing the department of pharmacognosy and working with the dean faculty of pharmacy and other heads of departments to deliver the agreed faculty and university strategic objectives. Developing and supporting academic staff in the department, and leading entrepreneurial activity for income-generating purposes as they promote the reputation and interests of the department within the university and to a wider community in the field of pharmacognosy.

Assistant Professor
Kabul University [Jul 15, 2008–Jul 7, 2019] Kabul, Afghanistan.
Main tasks: conduct research, teach classes, advise students on their studies, supervise Pharm. D. theses, and perform numerous administrative functions, such as attending university meetings and professional conferences or events. Leading laboratory practices and liaising with other university colleagues.

Senior Teaching Assistant
Kabul University [Dec 23, 2004–Jul 14, 2008] Kabul, Afghanistan.
Main tasks: doing work with the university professors for the preparation of lectures and exams, leading laboratory practices, grading papers and exams, and leading review and feedback sessions for the students. Collaborate with other academic staff in doing research in the field of pharmacognosy, publishing their findings, and liaising with other university colleagues.

Teaching Assistant
Kabul University [Dec 23, 2003–Dec 22, 2004] Kabul, Afghanistan.
Main tasks: assist the professors, lecturers, and technicians of the pharmacognosy department at the faculty pharmacy in the preparation of lectures and exams, grading papers and exams, and leading review and feedback sessions for the students.

Pharmacist in Medical Laboratory
National Institute of Medical Laboratories [Mar 3–Dec 22, 2003] Kabul, Afghanistan.
Main tasks: checking the details of specimens received for analysis; monitoring the stock levels of reagents used in the analysis; preparing chemical reagents used in the analyses; carrying out basic laboratory procedures in hematology, parasitology, and urology labs.

EDUCATION

Natural Sciences, Ph.D.
Faculty of Pharmacy, Philipps-Universität Marburg [November 21, 2016 – December 2022] Wilhelm-Roser-Straße 2, 35037 Marburg, Germany.

Pharmaceutical Sciences, M. Pharm.
Graduate School of Pharmaceutical Sciences, Kyoto University [2009 – 2011] Yoshida-honmachi, Sakyo-Ku, Kyoto-shi, 606-8501 Kyoto, Japan.

Pharmaceutical Sciences, B.Sc.
Kabul University [1999 – 2002] Jamal-mina, 1006 Kabul, Afghanistan.

Baccalaureate
Abdul Hadi (former Qazi Saifullah) High School [1993– 1995] Frinjal village, Ghorband district, Parwan, Afghanistan.

PROFESSIONAL TRAINING

1. **English Language Certificate**

English Language and Computer Learning Center (ELCLC) [Jan 5–Mar 23, 2016] Kart-e-Char, District-3, 1006, Kabul, Afghanistan.

2. **Academic Research Methodology Certificate**

University Support and Workforce Development Program (WSWDP) [Jun 11 – 15, 2015] Ministry of Higher Education, Kart-e char 1006 Kabul, Afghanistan.

3. **Application of HPLC**

Kabul University (with the support of the Japan International Cooperation Agency) [Nov 20–25, 2012] Faculty of Pharmacy Kabul University, Kabul Afghanistan.

4. **Managing Drug Supply & Rational Medicine Use**

Kabul University, Strengthening Pharmaceutical Systems (SPS)/MSH) [Dec 24–28, 2011] Faculty of Pharmacy Kabul University, Kabul Afghanistan.

5. **Production & Processing of Medicinal Plants**

Khorasan Research Institute for Food Science & Technology [Jun 25–30, 2008] Mashhad CCRF+RV9 Razavi Khorasan, Iran.

6. **Repair, Service & Maintenance of Biomedical Equipment**

Centre for Development of Advanced Computing (C-DAC) [Dec 27–Jan 19, 2007] Mohali, 160071 Punjab, India.

PUBLICATION

Books

1. Keusgen, M. et al. (**2020**). Medicinal Plants of Afghanistan, Meckenheim, DCM-Druk Center Meckenheim.
2. Karimi, A. G. & (**2015**). Text Book of Pharmacognosy, Kabul, Aazem Publications.
3. Shah & Qadry (**2008**). Pharmacognosy (A.G. Karimi, Trans. 2015), Faculty of Pharmacy, Kabul University.
4. Evans W. C. (2002). Pharmacognosy, Third Part: Principles Related to the Commercial Production, Quality, and Standardization of Natural Products (A.G. Karimi, Trans. **2008**), Faculty of Pharmacy, Kabul University.

Journal Articles

1. Wali, S., Karimi, A. G., & Ayoubi, R. (**2022**). Folkloric Management of Health Problems during Pregnancy: A Survey among Women in Kabul city, Afghanistan. *Hamdard Medicus*, *65*(1), pp. 1-12.
2. Karimi, A. G. et al. (**2019).** Ethnomedicinal study of plants used by people in Ghorband valley (Parwan, Afghanistan), Hamdard Medicus, 62 (2), pp. 5-30.
3. Karimi, A. G. & ITO, M. (**2012**). Sedative Effect of Vapor Inhalation of Essential Oil from *Heracleum afghanicum* Kitamura Seeds, Journal of Essential Oil Research, 24, 6, pp. 571 -577.
4. Karimi, A.G. et al. (**2018**). Factor associated with the tendency of people to traditional medicine in Kabul (in Persian), Faculty of Pharmacy Scientific Journal, 2, pp. 35 – 42.
5. Karimi, A.G. (**2016**). Traditional use of medicinal plants in Frinjal village, Ghorband, Parwan, Afghanistan (in Persian), Faculty of Pharmacy Scientific Journal, 1, pp. 55–62.
6. Karimi, A.G. (**2014**). Medicinal Plants Used in Traditional Medicine of Afghanistan (in Persian), Khorsheed, 12, pp. 36- 61.
7. Karimi, A.G. & ITO, M. (**2013**). Chemical Composition of Essential Oil from *Heracleum afghanicum* Kitamura Seeds (in Persian), Kabul University Scientific Journal, 3, pp. 121 – 127.
8. Karimi, A.G. & ITO, M. (**2012**). Chemical Composition of Essential Oil from *Heracleum afghanicum* Kitamura Roots (in Persian), Kabul University Scientific Journal, 1, pp. 102 – 109.
9. Karimi, A.G. & ITO, M. (**2012**). Sedative Effect of Essential Oil from *Heracleum afghanicum* Kitamura Roots (in Persian), Faculty of Pharmacy Scientific Journal, 4, pp. 55 – 62.
10. Seddiqui, M.N. & Karimi, A.G. (**2008**). Primary phytochemical analysis and medicinal importance of Sea Buckthorn (in Persian), Kabul University Scientific Journal, 1, pp. 26 – 35.

Conference Papers

1. Karimi, A. G. & ITO, M. (**2017**). Sedative activity of essential oil from *Heracleum afghanicum* Kitamura seeds. Proceedings of the Drug Discovery from Herb Conference, Daya Publishing House, First Ed. (pp. 203-210).
2. Karimi, A. G. & Keusgen M. (**2022**). Traditional use of medicinal plants in Kabul and Parwan provinces, Afghanistan. Proceedings of the DPhG Annual Meeting conference on From Behring to Biotechnology – moving Pharmaceutical Sciences towards One Health (p.53).
3. Karimi, A.G. & Keusgen M. (**2017**). Traditional use of medicinal plants in Ghorband valley, Proceedings of the Fourth Hamdard International Conference on Unani Medicine (p.74).

HONOURS AND AWARDS

1. **Hessen Funds Scholarship for Refugees - Highly Qualified Students and Scientist** (1 Oct 2022 – 30 Sep 2023). Ph.D. project at Philipps-Universität Marburg, Germany.
2. **DAUG-Cash prize** (5 Jan 2021). This prize was awarded by the Deutsch-Afghanische Universitäts-Gesellschaft e.V. for excellence in research and teaching.
3. India Science and Research Fellowship 2021-22 (No. INSA/DST-ISRF/2021/06/28.07.2021). This fellowship was for a research stay however, due to the crisis that occurred in Afghanistan in August 2021, it remained suspended and was not used.
4. **Certificate of Appreciation** (2021). This certificate was awarded by the Chancellor of Kabul University, Kabul, Afghanistan as excellence in pharmaceutical education online teaching during the Covid-19 pandemic.
5. **Certificate of Appreciation** (2021). This certificate was awarded by the Afghanistan Raisin, Fruit, Vegetable and Medicinal Plants Export Development Agency, in honor of providing a standard for quality evaluation of Hing (*Ferula asa foetida*) the main export crude drug of Afghanistan.
6. **DAAD Fellowship for the Guest Scientist** (Oct 21– Nov 31, 2019). Fellowship involved travel allowance and accommodation for the guest researcher at the Faculty of Pharmacy, Philipps Marburg University, Germany.
7. **HICUM Award** (9 Jan 2017 – 11 Jan 2017). The award involved a registration fee and accommodation for an oral presentation at Fourth Hamdard International Conferences on Unani Medicine, Karachi, Pakistan.
8. **NAM S&T Center Award** (30 Mar 2015 – 3 Apr 2015). The award involved travel allowance and accommodation for oral presentation at the Joint international training workshop on herbal medicine drug discovery from herbs, Mysuru, India.
9. **Certificate of Appreciation** (21 Jan 2015). This certificate was awarded by the Afghanistan Traditional Healers Association in honor of excellence in the traditional medicine investigation.
10. **Certificate of Appreciation** (18 Sep 2014). This certificate was awarded by the Faculty of Pharmacy, Kabul University as excellence in pharmaceutical education teaching.

11. **Certificate of Appreciation** (29 Dec 2012). This certificate was awarded by Jawzjan Governor, Jawzjan, Afghanistan in honor of excellence as a kankor examiner.
12. **Certificate of Appreciation** (9 Jan 2012). This Certificate of Appreciation was awarded by the Baghlan Governor and Education Directory in honor of excellence as a kankor examiner.
13. **Certificate of Appreciation** (2012). This certificate was awarded by the Kabora Institute of Higher Education, Kabul, Afghanistan as excellence in pharmaceutical education teaching.
14. **Japanese Government Scholarship** (1 Apr 2009 – 23 Mar 2011). M. Pharm. scholarship in the Graduate School of Pharmaceutical Sciences at Kyoto University, Kyoto, Japan.
15. **Japanese Government Fellowship** (4 Oct 2008 – 30 Mar 2009). The Fellowship involved travel allowance and accommodation for the guest researcher at the Graduate School of Pharmaceutical Sciences, Kyoto University, Japan.
16. **ICARDA Award** (25 Jun 2008 – 30 Jun 2008). The award involved travel allowance and accommodation for a training course entitled Production & processing of medicinal plants in Khorasan Research Institute for Food Science & Technology, Mashhad, Iran.
17. **ICCR-Fellowship** (27 Nov 2006 – 19 Jan 2007). The fellowship was awarded by Indian Council for Cultural Relations and involved travel allowance and accommodation for a training course entitled Repair, Service & Maintenance of Biomedical Equipment at the Centre for Development of Advanced Computing (C-DAC), Mohali, and Punjab, India.

CONFERENCES AND SEMINARS

1. Annual Meeting of the German Pharmaceutical Society-DPhG, From Behring to Biotechnology-moving Pharmaceutical Sciences towards One Health (Sep 13 -16, 2022), Marburg, Germany.
2. Fourth Workshop on Evaluation of Natural Resources in Afghanistan (Nov 26 – Dec 7, 2017), Rauischholzhausen/ Marburg, Germany.
3. Fourth Hamdard International Conference on Unani Medicine “Unani Medicine: Past, Present, and Future (Jan 9 – 11, 2017), Karachi, Pakistan.
4. Third Workshop on Evaluation of Natural Resources in Afghanistan (Nov 25 – Dec 4, 2016), Rauischholzhausen/ Marburg, Germany.
5. Second Workshop on Evaluation of Natural Resources in Afghanistan (Nov 29 – Dec 5, 2015), Rauischholzhausen/ Marburg, Germany.
6. Joint International Training Workshop on Herbal Medicine Drug Discovery from Herbs-Approaches, Innovations, and Application (Mar 30 – Apr 3, 2015), Mysuru, India.
7. First Workshop on Evaluation of Natural Resources in Afghanistan (Nov 30 – Dec 4, 2014), Rauischholzhausen/ Marburg, Germany.
8. The Eighth International Student Seminar (Mar 3 – 6, 2010), Kyoto University, Kyoto, Japan.
9. International Conference on Traditional Medicine of Afghanistan (2012). Ministry of Information and Culture, Kabul, Afghanistan.

LANGUAGE SKILLS

Mother tongue: Persian (Dari)

Other languages:

Language	Listening	Speaking	Reading	Writing
Pashtu	Proficient user	Proficient user	Proficient user	Proficient user
English	Independent user	Independent user	Proficient user	Proficient user
Arabic	Independent user	Basic User	Proficient user	Independent user
Japanese	Basic User	Basic User	Basic User	Basic User

PROJECTS CONDUCTED AND DIRECTED

1. Plant-Mediated Green Synthesis of Silver and Gold Nanoparticles Using Aqueous Extract of *Heracleum afghanicum* Kitamura (**2020-21**). A joint project of the Faculty of Sciences, University of Sistan & Baluchistan, Iran, and Faculty of Pharmacy, Kabul University, Kabul, Afghanistan.
2. Medicinal Plants Used in Shahristan District, Daykundi, Afghanistan (**2020**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
3. Medicinal Plants Prescribed Against Stomachache by the Traditional Practitioner in Kabul City, Afghanistan (**2020**), Parm. D. thesis, Faculty of Pharmacy, Kabul University.
4. Medicinal Plants Prescribed Against Peptic Ulcer by the Traditional Practitioner in Kabul City (**2020**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
5. Salang Corridor Flora and Fauna Baseline Study (**2019**), DAIRASABZ/SMEC-International, Unpublished.
6. Medicinal Plants Prescribed by Traditional Healers against Hemorrhoids in the West Parts of Kabul (**2019**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
7. Cough Remedies Prescribed by Traditional Healers in Charikar City, (**2018**), Parm. D. thesis, Faculty of Pharmacy, Kabul University.
8. Medicinal Plant Collecting of Surkhi Parsa Valley for the Herbarium (**2018**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
9. Medicinal Plants Used Against Hypertension in Babur Village, Parwan (**2017**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
10. Medicinal Plants Used in Bajigah valley, Baghlan (**2016**), B. Pharm. Thesis, Faculty of Pharmacy, Dawat University.
11. Medicinal Plants Used in Faraj valley, Panjshir (**2016**), B. Pharm. thesis, Faculty of Pharmacy, Kabora Institute of Higher Education
12. Medicinal Plants Traditionally Used in Ahandara Village, Takhar (**2016**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
13. Medicinal Plants Used in Folkloric Medicine of Sayed Khil, Parwan, (**2016**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
14. Medicinal Plants Used in Waras District, Bamyan, Afghanistan (**2016**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
15. Study of Medicinal Plants Used in Malistan, Ghazni, Afghanistan (**2016**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.

16. Traditional Use of Medicinal Plants in Qumchq Valley, Parwan, Afghanistan (**2015**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
17. Medicinal Plants Used in Khweshki Valley, Parwan, Afghanistan (**2015**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
18. Traditional Use of Medicinal Plants in Jighatu District, Wardak, Afghanistan (**2015**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
19. Medicinal Plants Used in Folkloric Medicine of Behsood-2 District, Wardak, Afghanistan (**2015**) Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
20. Traditional Use of Medicinal Plants in Sayed-Abad, Wardak, Afghanistan (**2015**), B. Pharm. Thesis, Faculty of Pharmacy, Dawat University, Kabul, Afghanistan.
21. Traditional Use of Medicinal Plants in Shakardara District, Afghanistan (**2014**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University
22. Medicinal Plants Traditionally Used in Yangi Qala District, Takhar, Afghanistan (**2014**), Pharm. D. thesis, Faculty of Pharmacy, Kabul University.
23. Medicinal Plants Used as a Laxative in the Traditional Medicine of Afghanistan (**2014**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
24. Medicinal Plants Used as an Expectorant in the Traditional Medicine of Afghanistan (**2014**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
25. Medicinal Plants Used in the Folk Medicine of Bihsood District, Wardak, Afghanistan (**2013**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
26. Medicinal Plants Used in the Treatment of Gastrointestinal Diseases in Afghanistan (**2013**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
27. Medicinal Plants Traditionally Used as Analgesic and Febrifuge in Afghanistan (**2013**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
28. Introduction of Medicinal Plants Used in folkloric Medicine of Ghorband (**2012**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
29. Medicinal Plants Used Against Prostatic Hyperplasia (**2012**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.
30. Traditional Use of Medicinal Plants in Yakawlang Valley, Bamyan (**2011**), Pharm. D. Thesis, Faculty of Pharmacy, Kabul University.
31. Mucilaginous Medicinal Plants for Prevention of Gastrointestinal Diseases (**2011**), Pharm D. Thesis, Faculty of Pharmacy, Kabul University.
32. Medicinal Plants Traditionally Used in the Treatment of Urinary Lithiasis in Afghanistan (**2011**), Parm. D. Thesis, Faculty of Pharmacy, Kabul University.

SUMMARY OF BOTANICAL EXPEDITIONS

DATE	*LOCALITIES VISITED*
OCT. 1 – 11, 2019	Parwan, Salang corridor, along the road from Jabalussaraj to Khinjan bridge.
JUL. 4, 2019	Kabul, Paghman valley, right side valley from the opening to the end.
JUN. 28, 2019	Kabul, Farza district the hillsides around Farza valley.
APR. 24 - 27, 2019	Parwan, Ghorband, Frinjal valley from the Chilgazi to Syahkhark.
MAY 1 - 3, 2018	Parwan, Ghorband, area around Frinjal.
APR. 27 - 29, 2018	Parwan, Ghorband, vicinity of Frinjal and Bagh-i-Kham.
APR. 19, 2018	Kabul, Paghman valley, in Daraikalan on both sides.
DEC. 29, 2017	Kabul, Khaki Jabar, Chakari.
SEP. 7 - 8, 2017	Parwan, Turkman valley from the opening to Khakriz village.
SEP. 5 - 6, 2017	Parwan, Ghorband, Frinjal valley.
AUG. 17, 2017	Parwan, Salang valley, around Salang pass.
JUL. 24 - 26, 2017	Parwan, Surkhi Parsa valley along the road from Miana Jowi to Saraurki as well as Jawz side valley from opening to the end (Chishma-i-Kozatani)
JUL. 28, 2017	Kabul, Paghman, Daraikalan, the right sub-valley from the beginning to the end.
JUL. 13 - 14, 2017	Parwan, Ghorband, Frinjal valley from Autapor to Maghzari.
JUL. 17, 2017	Kabul, Farza district, Farza valley along the river and its vicinity.
MAY. 05 - 09, 2017	Herat, Karukh, Dasht-i-House, Pul-i-Malan, and along the road to Zendajan.
MAY 11, 2017	Kabul, Paghman the right side of the Paghman valley from opening to the end.
MAY 12, 2017	Panjshir, Parandeh valley from the beginning to the end.
MAY 03, 2017	Panjshir, Tawakh, the opening of Dara-i-Hazara, and Abdullahkhil.
MAY 02, 2017	Kabul, Qargha area close to Kabul city.
APR. 27 - 29, 2017	Parwan, Koklami valley from the opening to Chihel Lakata village.
MAR. 25, 2017	Parwan, Ghorband, from Bagh-i-Kham to Doaab.
MAR. 21 - 24, 2017	Parwan, Ghorband, Frinjal valley from Sinjitak to Syahkhark.
NOV. 04 - 06, 2016	Ningarhar, Surobi to Darunta dam-Jalalabad.
AUG. 25 - 27, 2016	Bamyan, Shibar pass to Shahidan and the Bamyan city vicinity.
MAY 27, 2016	Panjshir, Parandeh valley from the beginning to the end.
MAY 23, 2016	Parwan, Salang valley along the road from Tajikan to Aolang.
MAY 20 - 21, 2016	Parwan, Ghorband from Shibar pass to Frinjal village.
MAY 12 - 19, 2016	Bamyan: Zuhak, Band Amir, Dara-i-Azdaha, Buda's vicinity, Yakawlang, Shuraba village, Anda valley, Naitaq, Folady and Ahangran, Shashpul-Hajigak, Shibar, Shahidan, Darai Khushkak, Shahidan, and Dara-i-Sumara.
JUL. 09 - 11, 2015	Parwan, Shikh Ali, from Jangalak to Shibar pass; Shingirian and Sangandab valleys.

JUL. 08, 2015	Parwan, Ghorband, along the road from the Puli-Matak to Frinjal village.
MAY 04, 2015	Parwan, Salang valley.
MAY 01, 2015	Kabul northwest, Istalif valley.
APR. 28, 2015	Panjshir, Faraj valley.
APR. 27, 2015	Kabul, area of the Paghman valley.
APR. 23, 2015	Panjshir, along the road from Dalansang to Bazark.
APR. 21, 2015	Kabul, around Qargha Dam.

NETWORKS AND MEMBERSHIPS

1. [Core member] Botanical Gardens Network (BGNet) (2020-03 to present). The Afghan Fellowship Legacy Projects, Hiroshima, Japan.
2. [Member] Technical Committee of Pharmaceutical and Cosmetics (13 Jan 2021 – present). Afghanistan National standard Authorities, Kabul, Afghanistan.
3. [Member] Editorial Board of Scientific Research Journal of Natural Sciences (2020 – 2021). Kabul University, Kabul, Afghanistan.
4. [Member] Research Committee (2019 – 2021). Faculty of Pharmacy, Kabul University, Kabul, Afghanistan.
5. [Member] Editorial Board of Scientific Journal of the Pharmacy Faculty (2019 – current). Faculty of Pharmacy, Kabul University, Kabul, Afghanistan.
6. [Member] Publication Board (2018 – current). Kabul University, Kabul, Afghanistan.
7. [Member] Curricula Development Committee (2014 – current). Faculty of Pharmacy, Kabul University, Kabul, Afghanistan.
8. [Member] Academic Council of Pharmacy Faculty (2012 – 2021). Kabul University, Kabul, Afghanistan.
9. [Member] Drug Investigation Committee (2012 – 2021). Directory of Avicenna, Ministry of Health, Kabul, Afghanistan.
10. [Member] Herbal Medicine Committee (2012 – 2021). Directory of Pharmacy, Ministry of Health, Kabul, Afghanistan.
11. [Member] Traditional Healers Committee (2012 – 2021). Directory of Pharmacy, Ministry of Health, Kabul, Afghanistan.
12. [Lifetime Member] Afghanistan Nationwide of Pharmacists Association (2005 – current). Kabul, Afghanistan.
13. [Member] Research Center (2011 – 2018). Kabul University, Kabul, Afghanistan.
    [Member] Evaluation of Private Institutes of Higher Education Committee (2013 – 2015). Ministry of Higher Education, Kabul, Afghanistan.