6 Comprehensive Overview of Some Edible Medicinal Plants from Kashmir Valley: Cultural, Economic, and Pharmacological Importance

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Abstract

Medicinal plants serve as the backbone of conventional healthcare systems of medicine and have been used since decades for the treatment of various diseases. Globally, around 50,000 species of medicinal plants are employed in traditional healthcare system of which Asia contributes a major part. These medicinal plants provide income to millions of people in both developing and developed countries. According to the World Health Organisation (WHO), around 80% population of the world depend on medicinal plants to meet their primary healthcare needs. During the past few decades, the use of herbal drugs has increased considerably because they are relatively cheap, more cost-effective, and less toxic than synthetic medicine.

The Indian subcontinent has a wide variety of medicinal plants species and the Himalayan region supports a considerable proportion of this rich floristic diversity. The valley of Kashmir is well known across the globe for its snow-covered mountains, spectacular lakes, green meadows, and pasture lands. The valley is also considered as a treasure vault of medicinal herbs that have been used in traditional system of medicine since decades. This traditional knowledge of healthcare is rapidly eroding due to rapid modernization. Furthermore, the Kashmir Himalayan medicinal plants have not been documented and if documented, attention has largely remained on their ethnobotany or strategies for conservation and management. The present chapter therefore attempts to gather information from a range of literature sources on some important edible medicinal plants from Kashmir valley with regard to their morphology, habitat and distribution, common and local names, traditional uses, and reported

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pharmacological activities. The findings of this chapter may help in identifying high-value traditional medicinal plant specifies for future drug development, promoting economic boost associated with locally available medicinal plants, and increasing public awareness from government agencies.

Keywords

Ethnomedicine · Kashmir Himalaya · Kashmir valley · Medicinal plants · Pharmacological activity

6.1 Introduction

According to a Chinese proverb, "Every plant is a medicinal herb." So, the company of nature in itself is a big healer and has remained an integral part of the medicinal systems since prehistoric times (Assefa et al. 2010). Recent estimates propose that more than 9000 types of plant species have known therapeutic properties, and this is without thorough scientific study among various indigenous communities (Farnsworth and Soejarto 1991). According to the World Health Organization (WHO), about 80% of the world population living in developing countries rely on the traditional plant-based system of medicines to fulfill their primary healthcare needs (WHO 2002).

During the last quarter-century, there has been a renewal of interest in herbal drug therapies as these are comparatively less toxic and more cost-effective than synthetic medicine (Chakraborty 2018). Given the high cost associated with synthetic drugs, herbal medicines have become an important trade and commercial sectors and are contributing greatly towards the socio-economic developments of various countries across the globe. The traditional system of medicine could not be the complete solution for human disease conditions; however, the ethnobotanical study remains one of the most potential approaches in drug discovery; approximately 25% of the drugs prescribed globally come from plant sources (Jabbar et al. 2007; Rates 2001).

The Indian subcontinent is a vast repository of medicinal plants and covers nearly 27% of the world's total known medicinal plant species (Krishna Kumar and Katakam 2002). In India, 90% of medicinal plants diversity is spread across broad range of forests, and only about 10% is confined to non-forest ecosystems. The Indian Himalayan Region (IHR) shares a significant part of this diversity, as can be seen in the literature reporting around 1748 species in this region (Joshi et al. 2016). There is a very high awareness of herbal drugs in ethnic communities from Trans-Himalayas to southern and western tips to four north-eastern corners. Kashmir Himalayas, one of the most spectacular regions of the IHR is located at the Northwestern tip of the Himalayan region and harbors rich biodiversity of medicinal plants (Fig. 6.1) (Jeelani et al. 2018). These plants form an important part of folk medicine and have been used since ages as home remedies for treating various ailments. However, this traditional knowledge of healthcare is eroding due to rapid socio-cultural changes. Until now, a limited number of studies have been carried out

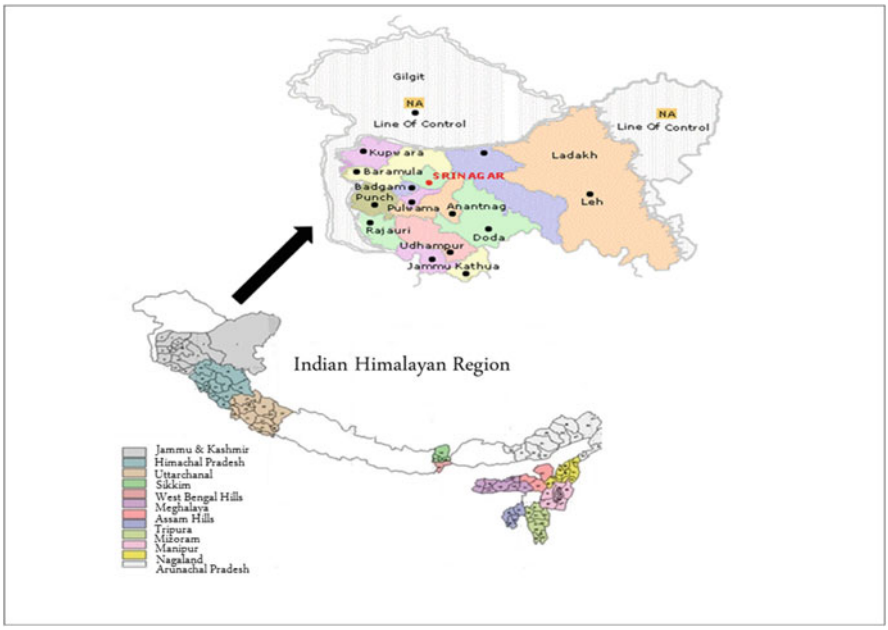

Fig. 6.1 Geographical hotspots of selected medicinal plants, image source, (ENVIS Centre on Himalayan Ecology 2020)

to comprehensively document the scientific information on the medicinal plant species of the Kashmir valley (Khan et al. 2004; Malik et al. 2011), which necessitates a need of comprehensive scientific documentation of these plants species. This chapter, therefore, documents some of the important medicinal plants of Kashmir valley concerning their accurate scientific information on morphology, common and local names for easy collection, distribution, and traditional uses across different indigenous communities. Additionally, the biological activities of these medicinal plants have been summarized using findings from published pharmacological and phytochemical studies. The findings of this work may not only help to boost the local economy of this region but also help to promote a base for future drug research and the utilization and protection of indigenous medicinal plants.

The appropriate literature was searched for relevant information through different electronic databases (PubMed, NISCAIR, Embase, Medline, and Google Scholar) using various keywords such as "medicinal plants," "Kashmir Himalaya,", "Kashmir valley," "ethnobotany," "ethnomedicinal uses," "ethnopharmacological properties," "medicinal uses," "pharmacological properties," and "biological properties." Studies selected for this chapter included medicinal plants that were: traditionally used across different indigenous communities of Kashmir valley; having ethnopharmacological evidence to support for local use; and having demonstrated in vitro or in vivo pharmacological activities. All the scientific

names were validated using the plant name index databases, such as Envis Centre on Medicinal Plants, National Gardening Association, and Medicinal Plants in India.

6.2 Distribution at Different Altitudes

The present study investigated a total of 30 species (Fig. 6.2) of indigenous edible medicinal plants grown at different altitudes in the Kashmir valley (Fig. 6.3a). Twelve species were found at altitudes of 1600-2800 m, 3 species at altitudes of 1700-3500 m, 3 species at altitudes of 2000-4500 m, 2 species at altitudes of 2100–3900, 2 species at altitudes of 2300-3800 m, 2 species at altitudes of 2400-4800 m, 2 species at altitudes of 2500-3500 m. The remaining 4 species were located at altitude ranges of 1500-3000 m, 1800-2600 m, 1900-3000 m, 3200-3900 m, respectively. Therefore, it can be concluded that the altitude range of 1600-2800 m represents the best sampling spot.

Fig. 6.2 Images of selected medicinal plants, image source, (Envis Centre on Medicinal Plants 2020; National Gardening Association 2020; Medicinal Plants in India 2020; Plants For A Future 2020)

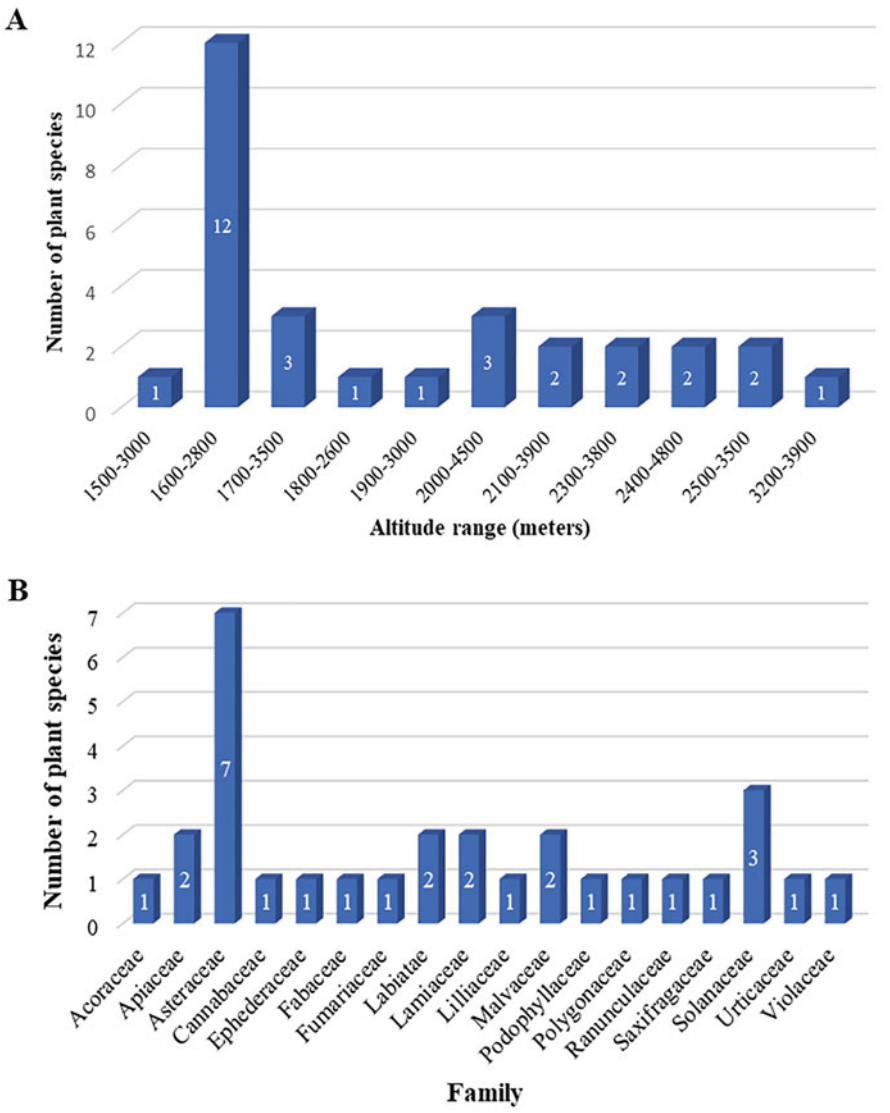

Fig. 6.3 (**a**) Altitude range frequencies (number of species); (**b**) Family distribution of selected medicinal plants

6.3 Taxonomic and Morphological Description

All of the plant species reviewed were angiosperms belonging to 18 families (Fig. 6.3b). Asteraceae was the most dominant family representing 7 (23.3%) plant species. Based on morphology (Table 6.1), it was found that 27 (90%) plant species were herbs, while 3 (10%) were shrubs.

6.4 Plant Part Used for Traditional Use

Herbal remedies for traditional use were found to be prepared from almost all plant parts including leaves, roots, seeds, flowers, fruits, rhizomes, stem, or the whole plant (Fig. 6.4). The most commonly used part was the leaf (26%), followed by roots (22%), seeds (15%), whole plant (14%) rhizome (9%), and flowers (8%). Medicinal formulations are usually made after shade drying these parts rather than using their fresh forms. Oral administration of these herbal formulations was the commonest.

6.5 Ailments Treated

Considering the ailments treated by these medicinal plants, the common ones included gastrointestinal problems, respiratory problems, infections, musculoskeletal problems, dermatological problems, CNS problems, wounds, cough/cold, dental, fever, and headache (Fig. 6.5a). The vast majority of plant species were used for treating gastrointestinal and respiratory problems (16 species each), followed by infections (13 species) and cough/cold (10 species). The least treated ailments were alopecia, menstrual irregularities, cardiac, circulatory, and liver problems (3, 3, 2, 2, 2 species, respectively). Herbal remedies were generally prepared by using techniques such as boiling, paste making, squeezing, decoctions, infusions, and grinding to powder (Table 6.2).

6.6 Reported Pharmacological Activities

By reviewing the pharmacological and phytochemical literature on the selected medicinal plants, it was revealed that these plant species possess a diverse range of pharmacological properties as listed in Table 6.2.Major pharmacological actions reported were antimicrobial and antioxidant (20 species each), followed by anticancer (16 species), antidiabetic (10 species), analgesic (7 species), and hepatoprotective (9 species) (Fig. 6.5b).

Table 6.1 List of selected medicinal plants from Kashmir valley with their botanical names, local names, family, altitude distribution, and habitat

Botanical name and Family	Local name (s)	English name(s)	Altitude range (meters)	Habitat/ Morphology	References
Achillea millefolium Asteraceae	Berguer or Pahal gassa	Common yarrow or Giant yarrow	1600–2800	Erect herbaceous perennial flowering plant (Fig. 6.2a)	Jeelani et al. (2018); Malik et al. (2011); Rather and Baba (2015)
Allium sativum Liliaceae	Rohun	Garlic	1600–2200	Bulbous herbaceous perennial plant (Fig. 6.2b)	Malik et al. (2011); Wagay (2018)
Arnebia benthamii Asteraceae	Kahzaban or Gawzaban	Macrotomia benthamii	2700–3500	Herbaceous perennial erect flowering plant (Fig. 6.2c)	Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Dioscorea deltoidea Asteraceae	Krath or Krees	Elephant's foot or yam	2300–2800	Perennial climbing herb (Fig. 6.2d)	Jeelani et al. (2018); Malik et al. (2011); Rather and Baba (2015)
Hyoscyamus niger Solanaceae	Van tamok or bazar bhang	Henbane or black henbane	1600–2100	Annual, biennial, or perennialherb (Fig. 6.2e)	Jeelani et al. (2018); Malik et al. (2011); Wagay (2018)
Lavetera kashmiriana Malvaceae	Jungli sonchal or Soz posh	Kashmir mallow	2100–2500	Perennial herbaceous plant (Fig. 6.2f)	Malik et al. (2011); Rather and Baba (2015)
Malva sylvestris Malvaceae	Gur Sachal or Sotsal	Mallow, high mallow, common mallow, or tall mallow	1600–1900	Annual or perennial herb (Fig. 6.2g)	Malik et al. (2011); Rather and Baba (2015);

(continued)

Table 6.1 (continued)

Botanical name and Family	Local name (s)	English name(s)	Altitude range (meters)	Habitat/ Morphology	References
					Wagay (2018)
Mentha arvensis Labiatae	Yan or Pudina	Corn mint, wild mint	1700–2500	Perennial erect branched aromatic (Fig. 6.2h)	Jeelani et al. (2018); Malik et al. (2011)
Rheum emodi Polygonaceae	Pumbchalan	Himalayan rhubarb	2500–3500	Perennial (Fig. 6.2i)	Jeelani et al. (2018); Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Taraxacum officinale Asteraceae	Handd	Dandelion-kukraundha, Kanphool, or dandelion	1600–2400	Herbaceous perennial weed (Fig. 6.2j)	Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Artemisia absinthium Asteraceae	Chawoo or Tethwan	Wormwood	1700–2200	Perennial shrub (Fig. 6.2k)	Jeelani et al. (2018); Malik et al. (2011); Wagay (2018)
Thymus serpyllum Lamiaceae	Jungle javind	Wild thyme, Breckland thyme, or creeping thyme	2000–2730	Perennial shrub (Fig. 6.2l)	Jeelani et al. (2018); Malik et al. (2011); Wagay (2018)
Urtica dioica Urticaceae	Kandyari or Soi	Stinging nettle	1600–2400	Perennial herb (Fig. 6.2m)	Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Viola odorata Violaceae	Numposh or Bunfsha	Sweet violet, English	1800–2600		Jeelani et al.

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Table 6.1 (continued)

Botanical name and Family	Local name (s)	English name(s)	Altitude range (meters)	Habitat/ Morphology	References
		violet, or garden violet		Flowering perennial herb (Fig. 6.2n)	(2018); Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Prunella vulgaris Labiatae	Kulwauth	Self-heal, common selfheal, or lance selfheal	1600–1900	Herbaceous plant (Fig. 6.2o)	Jeelani et al. (2018); Malik et al. (2011); Rather and Baba (2015); Wagay (2018)
Trigonella foenum-graecum Fabaceae	Meth	Fenugreek or sickle fruit fenugreek	1600–1900	Erect herbaceous plant (Fig. 6.2p)	Jeelani et al. (2018); Rather and Baba (2015)
Aconitum heterophyllum Ranunculaceae	Paewakh	Atees or Patris	2300–3800	Herbaceous plant (Fig. 6.2q)	Jeelani et al. (2018); Rather and Baba (2015); Wagay (2018)
Corydalis govaniana Fumariaceae	Sangi-harb	Govan's corydalis	2400–4800	Erect tufted perennial herb (Fig. 6.2r)	Dar et al. (2018); Rather and Baba (2015); Wagay (2018)
Datura stramonium Solanaceae	Datur	Thorn apple, jimsonweed, or Devil's snare	1600–2700	Erect annual herb (Fig. 6.2s)	Jeelani et al. (2018); Dar et al. (2018); Rather and Baba (2015);

(continued)

Table 6.1 (continued)

Botanical name and Family	Local name (s)	English name(s)	Altitude range (meters)	Habitat/ Morphology	References
					Wagay (2018)
Ephedra gerardiana Ephederaceae	Asmani buti	Ma Huang or Gerard jointfir	2000–4500	Perennial low-growing rigid tufted shrub (Fig. 6.2t)	Wagay (2018)
Podophyllum hexandrum Podophyllaceae	Van wangun	Himalayan Mayapple, Devil's apple, or Duck's foot	2400–4000	Succulent erect herb (Fig. 6.2u)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Tussilago farfara Asteraceae	Watpan	Coltsfoot	1600–2500	Perennial herbaceous plant (Fig. 6.2v)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Lamium album Lamiaceae	Zakhmi Dawa	White nettle or dead nettle	3200–3900	Herbaceous perennial plant (Fig. 6.2w)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Atropa acuminata Solanaceae	Chella Lubbar	Deadly nightshade, Indian belladonna, or Indian atropa	2000–3600	Herbaceous perennial plant (Fig. 6.2x)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Acorus calamus Acoraceae	Wia-gander	Sweet flag or Calamus	1600–2300	Semi-aquatic or marshy perennial herb (Fig. 6.2y)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Anthemis cotula Jeelani et al. (2018); Wagay (2018) Asteraceae	Fackgasa	Mayweed or stinking chamomile	1500–3000	Annual glandular herb (Fig. 6.2z)	

(continued)

Table 6.1 (continued)

Botanical name and Family	Local name (s)	English name(s)	Altitude range (meters)	Habitat/ Morphology	References
Bergenia Saxifragaceae	Zakhm-i-Hayat	Hairy Bergenia	1900–3000	Rhizomatic herb (Fig. 6.2AA)	
Bupleurum falcatum Apiaceae	Bormuje	Thorow-wax, sickle hare's ear, or sickle-leaved hare's-ear	2100–3900	Herbaceous perennial plant (Fig. 6.2AB)	Jeelani et al. (2018); Wagay (2018)
Cannabis sativa Cannabaceae	Bhang	Marijuana, hemp, or Gallow grass	1600–2400	Erect annual herb (Fig. 6.2AC)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)
Angelica glauca Apiaceae	Choora	Smooth Angelica	1700–3500	Glabrous aromatic perennial or biennial herb (Fig. 6.2AD)	Jeelani et al. (2018); Dar et al. (2018); Wagay (2018)

6.7 Economic Importance

Over the last two decades, medicinal plants have gained considerable interest within the pharmaceutical sector as they are deemed safe and cost-effective in contrast to synthetic medicines. According to WHO, the current market for herbal medicine is nearly US$14 billion per year which is expected to rise to US$ 5 trillion by the year 2050 (Sharma 2004). In India, the trade associated with herbal medicine is currently around US $1 billion per year, of which Northern Himalayas contribute a large part with unique flora from the Kashmir Himalayas (Joshi et al. 2004). The herbal medicine sector in India employs around 1.5 million traditional practitioners. Therefore, effective cultivation of medicinal plant species has a great advantage in raising the herbal drug industry (Pandey et al. 2013).

Considering the rich agro-ecological conditions of Kashmir Himalayas, its indigenous medicinal plant species produce high amounts of essential secondary metabolites than those found in other regions of India. Around 171 of 675 Himalayan edible medicinal plants are used by locals for treating several ailments (Samant et al. 2001), and about 81 aromatic medicinal plants are used to obtain essential oils (Kala et al. 2006). Notable among the aromatic species are *Lavandula officinalis*, *Rosa damascena*, *Dioscorea deltoidea*, *Podophyllum hexandrum*, *Mentha arvensis*,

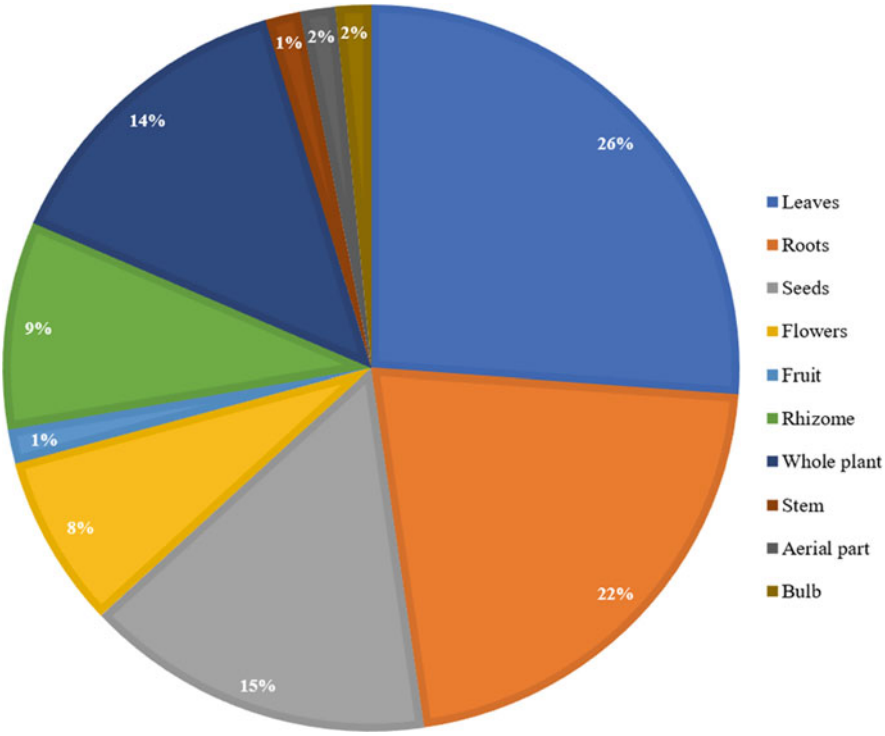

Fig. 6.4 Percentage distribution of plant parts used

Rosmarinus officinalis, *Artemisia absinthium*, and *Atropa acuminata.* The essential oils derived from these herbal plants are among the world's top 10 essential oils in aromatherapy (Khan et al. 2016). Considering these high-value medicinal plants, the valley of Kashmir offers a significant potential to establish the essential oil, perfumery, and pharmaceutical sector (Shawl and Kumar 2000). As discussed in the above sections of this chapter, many medicinal plant species are being used by folklore for treating various ailments like gastrointestinal problems, respiratory problems, infections, musculoskeletal problems, dermatological problems, cardiac problems, etc. This traditional knowledge of herbal drugs may generate significant economic benefits by providing a base for future drug research (Pandey et al. 2013).

6.8 Future Perspectives

Kashmir valley harbors a rich diversity of medicinal plants, with Kashmir division accounting for around 3000 such species (Dar et al. 2017). This chapter documented 30 medicinal plants from Kashmir valley having been used in the traditional system of medicine. Considering the current pharmacological and phytochemical investigations, it is evident that these herbal species possess a broad range of

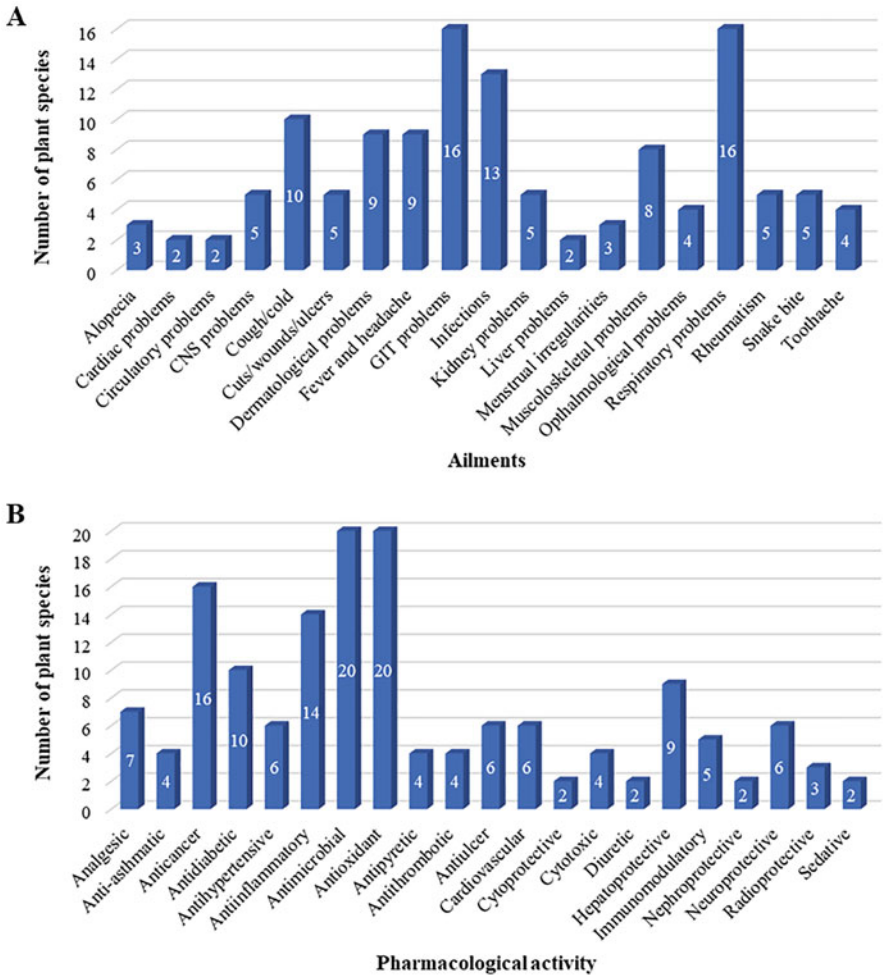

Fig. 6.5 (**a**) Frequency use of plant species based on different ailments; (**b**) Frequency distribution of plant species based on reported pharmacological activity

pharmacological activities that align with the traditional use. Since traditional use and chemical analysis of medicinal plants have generated valuable insights towards the discovery of new therapeutic agents (Cotton and Wilkie 1996), a comprehensive phytochemical and pharmacological research of locally used herbal species is needed which may lead to the development of novel biologically active compounds for the treatment of diseases which currently do not have the suitable cure.

Furthermore, the traditional knowledge of healthcare is eroding due to rapid socio-cultural changes. Moreover, indiscriminate and unscientific harvesting techniques have brought most of these species on the verge of extinction. Therefore,

Table 6.2 List of selected medicinal plants from Kashmir valley with their ethnomedicinal uses and reported pharmacological activities

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
Achillea millefolium	Whole plant, leaves, and flowers	It is used as antipyretic and for healing the bruises of snakebite. The flower is used as a laxative, diuretic, stimulant, and brain tonic. The decoction of leaves is used as a diaphoretic, stimulant, and also in colds. Leaves are chewed to treat toothache (Malik et al. 2011; Wagay 2018; Dar et al. 2018).	Antiulcer, hepatoprotective, anticancer, anti-inflammatory, antioxidant, antiproliferative, antimicrobial, antiparasitic, antispasmodic, cardiovascular, immunosuppressive, analgesic, and gastroprotective activity (Ali et al. 2017; Lakshmi et al. 2011).
Allium sativum	Bulb	Crushed bulbs when boiled in mustard oil are used to treat alopecia. Fresh bulb poultice is rubbed along the effective part of the body to cure skin diseases. The paste of bulb is used in the uterus to enhance conception and fertility. Crushed clove, taken along a glass of water is used for weight loss. The paste of bulb is applied externally on snake bite (Malik et al. 2011; Wagay 2018).	Antibacterial, antimicrobial, antihypertensive, anti-atherosclerotic, anti-thrombotic, antiulcer, hypolipidemic, antiulcer, anticancer, antidiabetic, hepatoprotective, radioprotective, neuroprotective, anti-inflammatory, antioxidant, and immunomodulatory activities (Tesfaye 2015; Mikaili et al. 2013; Bhandari 2012).
Arnebia benthamii	Whole plant, rhizome and roots	The decoction of the rhizome is used as a blood purifier and to treat fever, cough and cold. Extract of the whole plant in lukewarm water is used to enhance lactation in nursing mothers. Root extract mixed with hair oil is used for preventing hair fall (Malik et al. 2011; Rather and Baba 2015; Wagay 2018).	Antioxidant, antimicrobial, and cytotoxic activity (Ganie et al. 2014; Shameem et al. 2015).
Dioscorea deltoidea	Leaves and rhizome	The rhizome is given orally for curing snake bite. The paste of tuber powder mixed with edible oil is used by women to kill lice. The decoction of leaves is used to treat eye infections (Dar et al. 2018; Malik et al. 2011; Rather and Baba 2015; Wagay 2018).	Cardiovascular, neuroprotective, anticancer, antidiabetic, antimicrobial, antithrombotic anti-inflammatory, and immunological, activity (Mustafa et al. 2018).
Hyoscyamus niger	Leaves and seeds	Dried leaf powder is smoked in cigarettes as sedative.	Cerebro-spinal stimulant, hypotensive, cardio

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Table 6.2 (continued)

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
		Powder made from seeds is used to treat toothache. Seed paste mixed with oil is used to treat joint arthritis and eyelid abscesses (Malik et al. 2011; Rather and Baba 2015; Wagay 2018).	suppressant, and vasodilator, analgesic, anti-oxidant, anti-inflammatory, antipyretic, cytotoxic, neuroprotective, and antimicrobial activity (Aparna et al. 2015; Al-Snafi 2018).
Lavatera kashmiriana	Flower	Seeds are used as antiseptic. The paste made from dried flowers is used to treat mumps in children. (Malik et al. 2011; Rather and Baba 2015).	Anticancer and antibacterial activity (Rakashanda et al. 2012; Rakashanda et al. 2013).
Malva sylvestris	Whole plant, seeds, and roots	Powder of roots or extract of the whole plant is used for stomach cramps, dysentery, and diarrhea. Boiled seeds are used to treat cough and fever (Malik et al. 2011; Rather and Baba 2015; Wagay 2018).	Anticancer, hepatoprotective, antioxidant, and antimicrobial activity (Paul 2016).
Mentha arvensis	Aerial parts and leaves	It is used as a carminative and as a flavoring agent. Leaves are useful in headache and gastric upsets. Powder made from aerial parts is taken with curd to treat cough, sore throat, constipation, and indigestion (Jeelani et al. 2018; Wagay 2018).	Antibacterial, antioxidant, anti-inflammatory, antifertility, cardioprotective, antiallergic, and radioprotective activity (Thawkar 2016).
Rheum emodi	Rhizome and roots	Powder made from rhizomes is used to treat burns and ulcers. The root extract is used for abdominal discomfort and for treating prolonged cough (Malik et al. 2011; Wagay 2018).	Antiulcer, hepatoprotective, antidiabetic, anticoagulant and immunomodulatory, activity (Kaur et al. 2015).
Taraxacum officinale	Leaves and roots	Cooked dried leaves are given to ladies after childbirth to prevent blood loss. Dried roots are used as diuretic and tonic. The paste of leaves is mixed with turmeric and salt for treating fractures of bones (Dar et al. 2018; Malik et al. 2011; Rather and Baba 2015; Wagay 2018).	Anticancer, antidiabetic, choleretic, hypolipidemic antithrombotic, antioxidant, anti-inflammatory, and prebiotic activity (Choi et al. 2010; Koo et al. 2004).
Artemisia absinthium	Leaves and flowers	Leaves and flowering tops are used as an expectorant and for relieving joint pain and sprain	Anticancer, antiulcer, neuroprotective, anthelmintic, antidepressant, antibacterial,

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Table 6.2 (continued)

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
		swelling. The paste made from inflorescences and dried leaves is taken with water to treat worm infections and stomach upsets (Dar et al. 2018; Malik et al. 2011; Wagay 2018).	antimalarial, antiprotozoal, antipyretic, antioxidant, and hepatoprotective activity (Hussain et al. 2017).
Thymus serpyllum	Leaves and seeds	Leaves are used as a tonic, laxative, and for treating kidney and eye diseases. Infusion of leaves is used to treat skin ulcers. Powder made from seeds is used to treat worm infections in children. Leaf juice is used to cure alopecia (Dar et al. 2018; Malik et al. 2011; Wagay 2018).	Antihypertensive, antimicrobial, and anticancer activities (Jaric et al. 2015).
Urtica dioica	Leaves and roots	The paste of roots and oil is used to treat rheumatoid pain and for the healing of minor wounds. Extract of young leaves is used as diuretic and stomachic. The paste of roots boiled in mustard oil is used to cure cysts of hands and feet (Malik et al. 2011; Wagay 2018).	Antioxidant, antidiabetic, hepatoprotective, antimicrobial, antiviral, diuretic, cardiovascular, anticancer, anti-inflammatory, analgesic, and antiarthritic activity (Joshi et al. 2014).
Viola odorata	Leaves, seeds, and flowers	A mixture of flower powder and sugar is taken at bedtime daily for a week to treat respiratory infections, fever, and hoarseness of voice. The herb is also used to treat body swellings and muscular pains (Jeelani et al. 2018; Malik et al. 2011; Wagay 2018).	Antimicrobial, antipyretic, anticancer, cytotoxic, molluscicidal, sedative, hepatoprotective, laxative, antihypertensive, and antidyslipidemic activity (Mittal et al. 2015).
Prunella vulgaris	Leaves, seeds, and flowers	Seeds are used as antipyretic, diuretic, and laxative. A hot water bath of leaves and flowering is used to alleviate muscular pain, fever, and headache. The paste made from flowers is used to treat chest problems. Leaf powder is used as hypotensive, antispasmodic, and vermifuge (Jeelani et al. 2018; Malik et al. 2011; Wagay 2018).	Antimutagenic, antiviral, anticancer, antimicrobial, cardioprotective, antidiabetic, antistress, antiallergic, immunosuppressive, antioxidant, and anti-inflammatory activity (Rasool and Ganai 2013).

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Table 6.2 (continued)

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
Trigonella foenum-graecum	Leaves and seeds	The herb is used to treat back pain and throat infections (Jeelani et al. 2018; Rather and Baba 2015).	Antioxidant, antidiabetic, antilipidemic, anticancer, antimicrobial, anti-inflammatory, hepatoprotective, nephroprotective, and antiulcer activity (Yadav and Baquer 2014).
Aconitum heterophyllum	Roots	The decoction of roots is used for treating abdominal disorders. Crushed dried roots are mixed with oil and used for headache, skin problems, and joint pains. Roots are also used for urinary infections, throat infections, dyspepsia, vomiting, diabetes, diarrhea, and cough (Jeelani et al. 2018; Wagay 2018).	Hepatoprotective, antioxidant, anodyne, anti-flatulent, anti-periodic, analgesic, antipyretic, and carminative activity (Paramanick et al. 2017).
Corydalis govaniana	Roots and seeds	Seeds and roots are used in the treatment of eye infections (Wagay 2018).	Analgesic and antioxidant activity (Muhammad et al. 2015; Shrestha and Adhikari 2017).
Datura stramonium	Whole plant, leaves, and seeds	Sun-dried seed powder is used to treat respiratory diseases when taken with water. Seed powder mixed with mustard oil is used to treat rheumatism. Seed smoke is used to cure toothache. The decoction made from leaves and petals is used for treating skin eruptions. The plant is also used for intestinal problems, boils, and headache (Jeelani et al. 2018; Dar et al. 2018; Wagay 2018).	Antiasthmatic, anticholinergic, antimicrobial, anticancer, larvicidal, antimicrobial, anti-inflammatory, acaricidal, repellent, and oviposition deterrent activities (Soni et al. 2012; Gaire and Subedi 2013).
Ephedra gerardiana	Whole plant	Acts as a source of ephedrine which is used in the treatment of asthma and to prevent heart block. It is also used in cold, cough, bronchitis, arthritis, blood infections, bile complaints, and as an expectorant (Wagay 2018).	Anti-asthmatic, antioxidant, antimicrobial, anti-arthritic, cytotoxic, antitumor activities (Khan et al. 2017; Uttra 2017; Jamil et al. 2012; Chaitanya et al. 2014).
Podophyllum hexandrum	Whole plant, rhizome,	The paste of rhizome is applied externally for treating snake bite. The rhizome is also used as purgative in	Anticancer, antiviral, radioprotective, antifungal, antioxidant, immune-stimulatory, and

(continued)

Table 6.2 (continued)

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
	roots, and fruits	chronic constipation. Fruit juice is taken against stomach ulcers and dyspepsia. Root powder taken with water is used against heart burns. The plant is also used for treating skin diseases, tumors, menstrual irregularities, urinary infections, and back pain (Jeelani et al. 2018; Wagay 2018).	antirheumatic activities (Rather and Amin 2016).
Tussilago farfara	Leaves and roots	Leaves and roots are used as an expectorant, stimulant, and tonic, in asthma, bronchitis, chest problems, and inflammation. (Jeelani et al. 2018; Dar et al. 2018; Wagay 2018).	Antioxidant, anti-inflammatory neuroprotective, and antimicrobial activities (Cho et al. 2005; Hwangbo et al. 2009; Kačániová et al. 2013).
Lamium album	Whole plant	Extract of whole is used to treat burns, wounds, and uterine bleeding (Jeelani et al. 2018; Wagay 2018; Rather and Baba 2015).	Antioxidant, antimicrobial, antidiabetic, cytoprotective, and anti-inflammatory activities (Kelayeh et al. 2019).
Atropa acuminata	Roots and leaves	The decoction of roots is used in cough and abdominal problems. The root powder is mixed with ghee and applied externally on affected portions to treat rheumatism. It is also used as narcotic, sedative, antispasmodic, and for treating cough and asthma (Jeelani et al. 2018; Dar et al. 2018; Wagay 2018).	Analgesic, antispasmodic, hallucinogenic, mydriatic, narcotic, and sedative activities (Maqbool et al. 2014).
Acorus calamus	Rhizome and roots	Extract of roots is used as stomachic and to treat diarrhea and cough. Root paste is mixed with ghee and applied to treat swelling of joints. It is also used to treat wounds and worm infections (Jeelani et al. 2018; Dar et al. 2018; Wagay 2018).	Anti-inflammatory, immunomodulatory, hypotensive, anticancer, cardioprotective, anti-asthmatic, hypolipidemic, antidiabetic, anticholinesterase, antimicrobial, and pesticidal activities (Rajput et al. 2014).
Anthemis cotula	Whole plant, leaves, and seeds	Whole plant extract is used for muscular pains. Leaves are rubbed onto the insect bite or relieve pain. Seeds are used as	Antioxidant, acetylcholinesterase, butyrylcholinesterase, tyrosinase, amylase, and

(continued)

Table 6.2 (continued)

Plant	Plant part (s) used	Ethnomedicinal uses	Pharmacological activities
		insect repellents (Jeelani et al. 2018; Wagay 2018).	glucosidase activities (Sut et al. 2019).
Bergenia ciliata	Rhizome, roots, and leaves	The root extract is used as a tonic in fever, diarrhea, and cough. Leaf juice is used to treat earache. Rhizome decoction is used as a diuretic, and for treating asthma and gastric problems, bladder stones, menstrual irregularities, skin diseases, and wounds (Jeelani et al. 2018; Wagay 2018).	Antioxidant, antimicrobial, and cytoprotective activities. (Singh et al. 2017; Hendrychova and Tumova 2012)
Bupleurum falcatum	Whole plant, roots	Whole plant powder is given orally for snake bite. Root extract is beneficial in liver diseases and abdominal pain (Jeelani et al. 2018; Wagay 2018)	Antiulcer, anti-asthmatic, anti-nephroprotective (Chen et al. 2008; Matsumoto et al. 2002).
Cannabis sativa	Leaves, seeds, and stem	Dried leaf powder mixed with egg yolk in small quantities is used to treat excessive urination in children and menstrual irregularities. Powder of stem and leaves mixed with ghee is used to treat skin diseases. Leaves are smoked as sedative. It is also used to treat rheumatism, cholera, blood problems, diarrhea, gastric problems, piles, and urinary infections (Jeelani et al. 2018; Dar et al. 2018; Wagay 2018)	Abortifacient, analgesic, anaphrodisiac, anti-anaphylactic, anti-androgenic, antibacterial, anticonvulsant, anti-Parkinsonian, anti-estrogenic, antifertility, antiglaucomic, antigonadotropin, anti-inflammatory, antispasmodic, anti-spermatogenic, Anticancer, CNS depressant, cataleptic, DNA synthesis inhibition, estrous cycle disruption, hypotensive, hypoglycemic, and mutagenic activities (Lohar and Rathore 2013).
Angelica glauca	Roots	The root powder is applied to treat toothache. It is also taken with water to treat stomach disorders (Jeelani et al. 2018; Dar et al. 2018; Rather and Baba 2015; Wagay 2018).	Broncho-relaxant, antioxidant, antimicrobial, and phytotoxic activities (Sharma et al. 2017; Irshad et al. 2011).

appropriate guidelines and strategies for the conservation and sustainable use of medicinal plants need to be formulated and implemented. Also, strenuous efforts should be made to encourage the mass cultivation of medicinal plants which in turn would ensure the continuous supply of these medicinal plants, both for indigenous

and commercial use. Finally, joint efforts between the government and local people and the implementation of education programs aimed at conveying the importance of traditional medicinal plants are of utmost importance in boosting the economic development associated with these medicinal plants.

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