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Traditionally Important Herbaceous Medicinal Plants of Majathal Wildlife Sanctuary, District Solan, Himachal Pradesh, North Western Himalaya, India

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Abstract

The Himalayas is one of the mega diversity hotspots of the world, which contribute a great to the biodiversity wealth of the world. Among the biogeographic provinces of India, the Indian Himalayan Region (IHR) is well known for its diversity of ethnomedicinal plants. Majathal Wildlife Sanctuary is situated in District Solan, Himachal Pradesh, North Western Himalaya, India. In the present study, social surveys were conducted through the application of semi-structured questionnaire. All 39 villages inside and near the boundary (up to 2 km) were selected for the survey in the sanctuary. All the houses were surveyed and people of different ages and sexes were asked and their responses were recorded. A reconnaissance survey was conducted for the floristic diversity in the area and plant samples were collected for identification and herbarium preparation. In the sanctuary, there were 51 species of herbaceous medicinal plants identified which were used by local people. The results showed that the knowledge regarding medicinal plants was very less in the new generation as compared to the old age and middle age people. This study will help to know more medicinal plants from the villages and procure knowledge for future studies. This documented information will be preserved and utilized for mankind and make local communities economically stable and healthy.

Keywords: Diversity, Economically important, Ethnobotanical, Therapeutic

Introduction

India is one of the mega diverse countries of the world, where nature has given different gifts to human and mankind. The Himalaya, which means "Abode of Snow" in Sanskrit, is one of the world's newest mountain ranges, is considered among the most delicate and fragile regions, which is still evolving and developing. This region also represents one of the Global Biodiversity Hotspot- the Himalayan Biodiversity Hotspot (HBH) (Sharma et al., 2014). The Indian Himalayan Region - IHR, occupies the northern boundary (North west to North east) of the country and stretches over 2,500 km from Jammu and Kashmir in the west to Arunachal Pradesh in the east. The region covers partially/ fully eleven mountainous states and two Union Territories of India. IHR has a total geographical area of approximately 5,31,250 km². Samant et al. (1998) reported 1768 plant species from the Western Himalayan region which are used as medicinal in the local natural healing practices. The Indian Himalayan Region (IHR) represents 18,940 species of plants; 8,500 species (40% endemic) are represented by Angiosperms; 44 species (15.91% endemic) by Gymnosperms, 600 species (25% endemic) of Pteridophytes; 1737 species (32.53% endemic) of Bryophytes, 1,159 species (11.22% endemic) of Lichens; and 6,900 species (27.39% endemic) of Fungi (Singh & Hajra, 1996). Flora of Himalaya is always interesting for study by many researchers as it represents its uniqueness because of its specific habitat and endemism (Rawat et al., 2013). The Indian Himalayan Region gives a suitable habitat for the half of the flowering plant species in India, of which nearly 30% of species are endemic which gives Himalayas a great gift from nature (Bargali et al., 2022).

India is known for its culture and traditional knowledge of plants in different aspects, as the maximum of the population resides in the villages. From ancient times we used plants for different purposes like medicinal, edible fruit, food, fibre, fodder, timber, rituals and religious and meditation. In India 95% of plants are used as medicines by local

people and villagers which are directly collected from the wild (Uniyal et al., 2000). Traditional medicinal plants are the main method of healing practiced in rural India as well as in the world and there is also a great scope to explore more and conserve plants (Uniyal et al., 2006). But now these days the knowledge of medicinal plants is declining and new generation don't know their importance and existence. Documented information will be preserved and utilized for mankind and better bioprospective research. With this knowledge of herbaceous medicinal plants, the present study was done in the Majathal wildlife sanctuary to know the economic status of villagers, their dependency on medicinal plants, plant diversity, use patterns, and different ailments which are treated by local people.

Materials and Methods

Study site

Majathal Wildlife Sanctuary is located in Solan district (Wildlife Division, Shimla) of Himachal Pradesh, North-western Himalyan region in India (Figure1). Sanctuary has a geographical area of 37.16 km^2. It is just near to the Sutlej river in Kol Dam Catchment area which makes its boundary with the river. It experiences a variation of altitude from 600 to 1972 m asl. The average annual precipitation is 1,525 mm and temperature ranges between 1ºC to 35ºC. The main forest types present are Sub tropical pine forest and Ban oak forests and few patches of Deodar at higher peaks. The sanctuary is situated in the laps of nature with unique biodiverse flora and diverse use patterns. The shape file and boundary was procured from the Himachal Pradesh Forest Department which were used to make maps with the help of google earth.

Field survey

Social ethnobotanical survey was conducted by preparation of semi structured questionnaire with help of relevant literature. All the villages inside and near to the boundary (up to 2 km) were selected for the survey in the sanctuary for ethnobotanical studies. 39 villages (Table 1) were studied and all information was recorded like Panchayat name, Tehsil and District. All the houses were surveyed for the peoples socioeconomic status (Table 1 and 2), traditionally herbaceous medicinal plants knowledge along with their common names, habit, part used, method of use, and uses through interviews and discussion with local people and traditional healers from different ages and sexes (Figure 2). All ages people were asked and data were recorded and analysed in Microsoft excel.

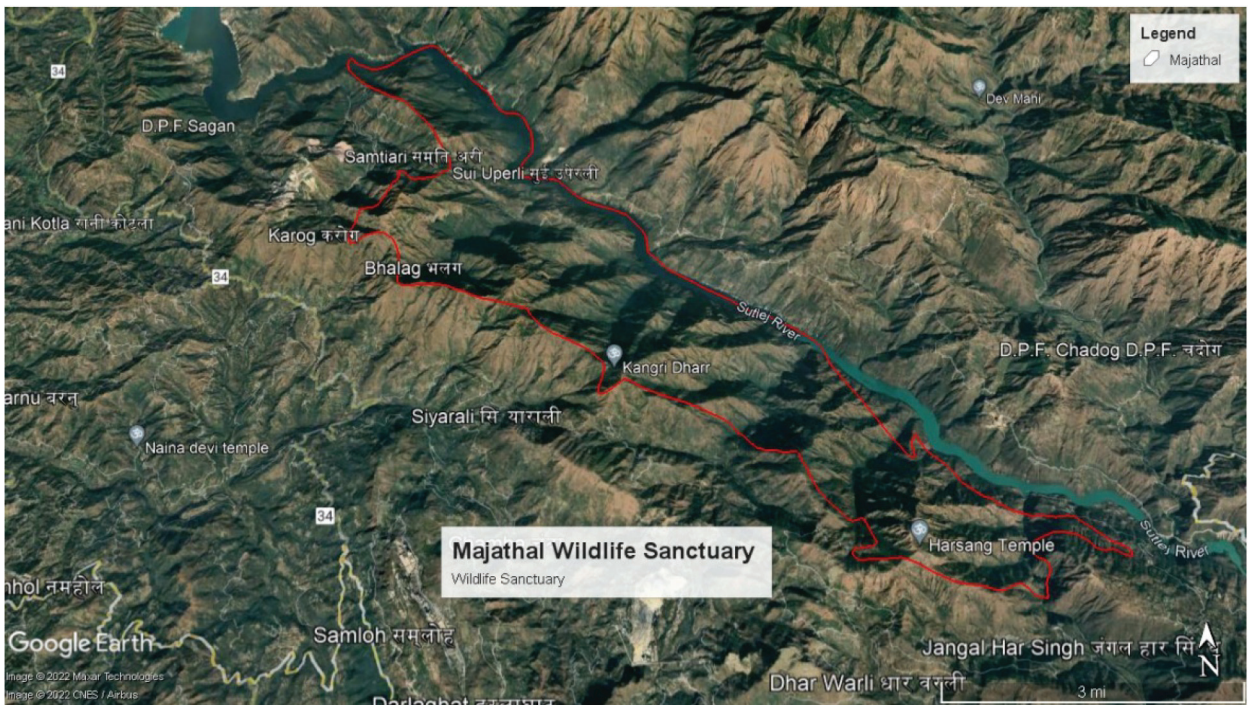

Figure 1: Map of Majathal Wildlife Sanctuary, District Solan, Himachal Pradesh, India (view from google earth)

Table 1: List of villages and income status of villagers

S.N.	Name of village	Name of panchayat	Name of tehsil	Name of district	Annual income of households (in Indian rupee)			
					Low	Medium	High	Total
1	Bambeli	Sewda Chandi	Arki	Solan	40	34	6	80
2	Banali	Sewda Chandi	Arki	Solan	4	4	2	10
3	Bani	Berel	Arki	Solan	3	2	0	5
4	Chalyaun	Sewda Chandi	Arki	Solan	4	4	1	9
5	Chayanda	Sewda Chandi	Arki	Solan	5	3	0	8
6	Chilla	Mandhodghat	Sunni	Shimla	3	3	1	7
7	Daud	Sewda Chandi	Arki	Solan	1	1	0	2
8	Dhar Parali	Sewda Chandi	Arki	Solan	5	4	1	10
9	Dhar Warali	Sewda Chandi	Arki	Solan	5	3	1	9
10	Gaud	Sewda Chandi	Arki	Solan	2	1	0	3
11	Jandoi	Berel	Arki	Solan	2	0	0	2
12	Jandred	Sewda Chandi	Arki	Solan	1	1	0	2
13	Jod	Chanawag	Sunni	Shimla	1	1	0	2
14	Jubbad	Sewda Chandi	Arki	Solan	3	2	1	6
15	Kangari Dhar	Sewda Chandi	Arki	Solan	7	8	3	18
16	Kheda	Berel	Arki	Solan	5	3	1	9
17	Kufar	Sewda Chandi	Arki	Solan	4	3	1	8
18	Kungaru	Berel	Arki	Solan	4	2	1	7
19	Kyardu	Sewda Chandi	Arki	Solan	3	2	1	6
20	Kyari	Sewda Chandi	Arki	Solan	1	1	0	2
21	Labdath	Berel	Arki	Solan	2	2	0	4
22	Madrech	Mandhodghat	Sunni	Shimla	6	7	2	15
23	Maryanga	Sewda Chandi	Arki	Solan	3	4	1	8
24	Matrech	Berel	Arki	Solan	4	4	2	10
25	Neudi	Sewda Chandi	Arki	Solan	2	1	0	3
26	Panjeena	Sewda Chandi	Arki	Solan	9	8	2	19
27	Parmadhar	Chanawag	Sunni	Shimla	8	9	3	20
28	Paryab	Sewda Chandi	Arki	Solan	5	3	1	9

S.N.	Name of village	Name of panchayat	Name of tehsil	Name of district	Annual income of households (in Indian rupee)			
					Low	Medium	High	Total
29	Ratiya	Juni	Sunni	Shimla	11	7	4	22
30	Riddi	Sewda Chandi	Arki	Solan	5	4	1	10
31	Rudal	Sewda Chandi	Arki	Solan	9	9	4	22
32	Saryali	Sewda Chandi	Arki	Solan	6	6	3	15
33	Saura Brahmna	Sewda Chandi	Arki	Solan	4	6	2	12
34	Saura Kaneta	Sewda Chandi	Arki	Solan	6	3	1	10
35	Sayarali	Berel	Arki	Solan	6	3	1	10
36	Sewda	Sewda Chandi	Arki	Solan	7	9	3	19
37	Tikaru	Sewda Chandi	Arki	Solan	2	1	0	3
38	Ubala Sakor	Berel	Arki	Solan	3	4	3	10
39	Undala Skor	Berel	Arki	Solan	21	18	6	45
Total					222	190	59	471

Table 2: Income attributes of villagers and classes

S.N.	Income group	Annual income	No. of households
1	Low Income	< 25000	222
2	Medium Income	25000-250000	190
3	High Income	> 200000	59

Plant samples collection and identification

A reconnaissance survey was conducted for the floristic diversity in the area and plant samples were collected for identification and herbarium preparation. Collected samples were prepared by following the standard methodology and identified with the help of local flora and experienced scientists at Himalayan Forest Research Institute, Shimla, India (Chowdhery & Wadhwa, 1984; Dhaliwal & Sharma, 1999; Singh & Rawat 2000). Catalogue of life website (https://www.catalogueoflife.org/) was used for nomenclature and authenticity of plants.

Results and Discussion

During the survey 617 respondents from different ages, classes, sexes and economic status were asked for their traditional knowledge and healing practices (Figure 2 and 3, Table 3). Total respondents from different age classes (young age-133, middle age-296 and old age-138) (Figure 2) gave their information and importance of herbaceous medicinal plants used in their day to day life.

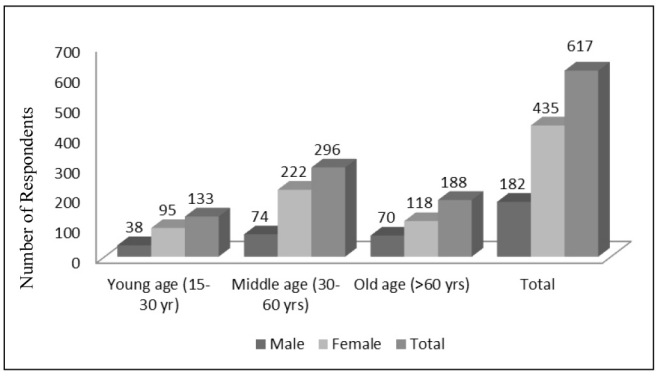

Figure 2: Age and genderwise distribution of respondents population of Majathal Wildlife Sanctuary villages

The major population of the area was belonging to the lower income class 222 houses (47%), medium income class 190 houses (40%) very less from the higher income class 59 houses (13%) (Figure 3, Table 2).

A total of 51 species of herbaceous medicinal plant were identified which belong to 46 genera and 30 families (Figure 4, Table 4). Dominant families which contributed the maximum for the herbaceous

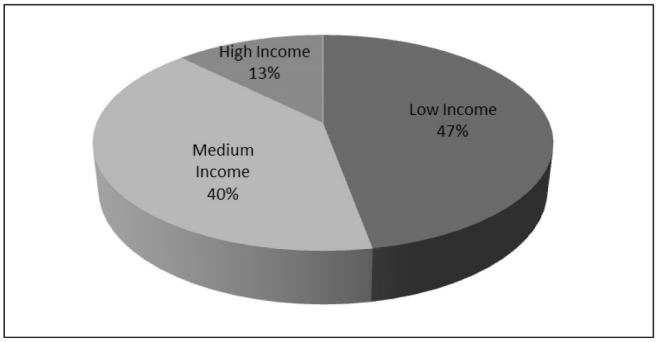

Figure 3: Economic status of respondent households of Majathal Wildlife Sanctuary villages and income attributes

medicinal plants were Lamiaceae (6 genera, 8 spp.), Apocynaceae (5 genera, 5 spp.) followed by Amaranthaceae (2 genera, 3 spp.) and Poaceae (3 genera, 3 spp.) as shown in the Figure 5.

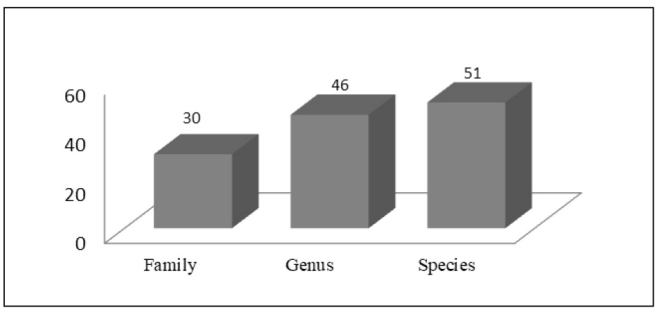

Figure 4: Herbaceous ethnomedicinal plants distribution pattern of Majathal Wildlife Sanctuary villages

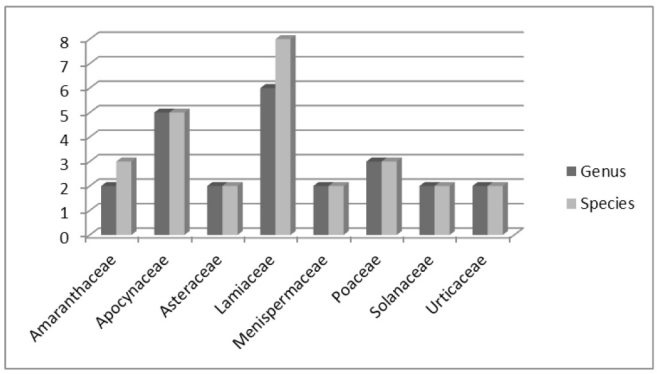

Figure 5: Representation of dominant families of the herbaceous ethnomedicinal plants in Majathal Wildlife Sanctuary

Results revealed that there were different plant parts used as medicines which were practiced by local people and traditional healers. Leaves (32 spp.) were the maximum plant part used followed by roots, rhizomes, tubers (15 spp.), seeds (5 spp.), flower, fruit and latex 3 species each (Figure 6).

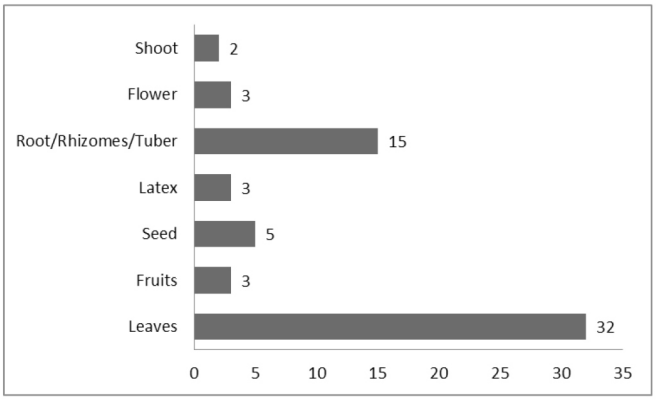

Figure 6: Plant part used as ethnomedicine from different plant species

There are many diseases that were treated by herbaceous medicinal plants like jaundice, fever, insomnia, asthma and loss of appetite, stomach ache, diabetes, burnt wounds, cuts and wounds, headache, bone fractures, joint pains, post parturition health benefits, constipation, immunity booster, skin allergies, eye allergies, neural problems, enhancing lactation in females after childbirth, to remove worms from kids stomach, noose bleeding, internal body heat, indigestion, toothache and oral health related, animals diseases (fever, toothache, bone fracture, immunity boosting) etc. (Table 4). The main area for the concern from the study was found that the average number of plants known in the age classes is quite different and which is declining drastically in the young age groups (young age-12 plants, middle age-18 plants, old age- 33 plants). The decrease in the knowledge may be because of the young generation is not interested, easy availability of allopathic medicines, less communication regarding this topic with old age persons because knowledge was traveling through mouth only, herbal medicines don't show instant relief and less trust in herbal traditional medicines.

The practice was still in practice where the roads connectivity is less and resources and less. Maximum dependency on traditional herbal medicine system was by lower economic and medium economic people in the sanctuary. A similar type of studies was done by many researchers (Rana & Samant, 2011; Samant et al., 2007; Singh et al., 2020; Singh et al., 2021). They also reported medicinal plants and use pattern from local area and found maximum dependency on wild plants for healing. People from economically lower and middle class use more traditional plants as compared to the higher class. There is a decline in the knowledge of ethnomedicinal plants in next generation.

To conserve the traditional knowledge we all need to join hands and make awareness in the young generation to educate them with the roots of culture, tradition and real wealth of the plant diversity and bioprospecting of these plants for the future.

Table 3: Distribution of knowledge of ethnomedicinal plants among different age groups in Majathal Wildlife Sanctuary

Age class	Attribute	Average no. of plants known to respondents
Young age	15-30 yrs	12
Middle age	31-60 yrs	18
Old age	>60 yrs	33

Table 4: Information about the Ethnomedicinal plants, their availability, part used and different uses by villagers of Majathal Wildlife Sanctuary

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
1	*Achyranthes aspera* L.	Puthkanda	Tropical & Subtropical Old World	Amaranthaceae	Herb	Summer and Rainy	Roots and leaves	Crushed roots used for cough and cold, crushed leaves and roots for toothache
2	*Achyranthes bidentata* Blume	Puthkanda	Tropical & Subtropical Asia to NW Pacific	Amaranthaceae	Herb	Summer and Rainy	Roots and leaves	Crushed roots used for cough and cold, crushed leaves and roots for toothache
3	*Adiantum lunulatum* Cav.	Maiden Hair Fern, Hamsapadi	Western Himalaya	Pteridaceae	Fern	Whole Year	Leaves	Leaves paste is applied on cuts, burnt wounds, anti-inflammatory and to cure diarrhea, its paste is applied on scorpion bite area.
4	*Agave vivipara* L.	Gob, Goba, Ramban	Mexico	Agavaceae	Herb	March-April	Inflorescence	Inflorescence base is boiled and used as abortifacient in local areas.
5	*Ajuga integrifolia* Buch.-Ham. ex D.Don	Neelkanthi	From northeast Africa, through Arabia, temperate and tropical Asia to New Guinea, Indonesia, Nepal, India, Pakistan	Lamiaceae	Herb	March-Nov.	Leaves, Roots	Leaves powder is used to cure diabetes, skin allergies. The juice of the root is used in the treatment of diarrhea and dysentery, leaves used to cure malarial fever
6	*Aloe vera* (L.) Burm.f.	Kuarpatha, Bagnol	Oman	Asphodelaceae	Herb	Whole Year	Leaves	Boiled leaves is used as vegetable, leaves gel applied on burns, skin allergies and sunburns and hair, leaves juice given in constipation, jaundice, diabetes
7	*Amaranthus viridis* L.	Chulai	SE. Mexico to Tropical America	Amaranthaceae	Herb	Sept.-Oct.	Leaves, seeds	Decoction of the plant is used to stop dysentery and to purify the blood.
8	*Anagallis arvensis* L.	Krishna neel, Blue Pimpeneral	Europe to Central Asia and Himalaya, N. Africa to Ethiopia and Arabian Peninsula	Primulaceae	Herb	March-April	Leaves	Used for treating fever, urinary tract problems and constipation
9	*Arisaema tortuosum* (Wall.) Schott	Kiaru	Indian Subcontinent to S. Central China	Araceae	Herb	July-Aug.	Whole shoot	Leaves to treat asthma, bronchitis, cold, cough,
10	*Artemisia vulgaris* L.	Chhamber	Temp. Eurasia to Indo-China, N. Africa	Asteraceae	Herb	Aug.-Sept.	Leaves	Leaves paste is applied on fresh cut wounds, leaves paste given for malarial fever

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
11	*Bergenia ciliata* (Haw.) Sternb.	Patharchur, Patharchat, Bashanbhed	Western Himalaya to South Western Nepal	Saxifragaceae	Herb	March-April	Leaves	Leaves used to cure kidney stone, stomach acidity, burnt wounds, treatment of diarrhea, vomiting, fever, cough, diabetes,
12	*Cannabis sativa* L.	Bhang	Central Asia to Xinjiang and Pakistan	Cannabaceae	Herb	Leaves- whole year	Seeds and Leaves	Leaf paste is applied on wasp and honey bee sting and swelling on body parts, leaves given for pain relief, insomnia, asthma and loss of appetite, roasted seeds paste is applied on wound, leaves also given to animals for the digestion problems and loss of appetite,
13	*Catharanthus roseus* (L.) G.Don	Sarabahar, Madagascar periwinkle	Madagascar, Europe and Asia	Apocynaceae	Herb	Whole year	Leaves, roots	Leaves and roots used to treat diabetes, jaundice
14	*Cryptolepis buchananii* R.Br. ex Roem. & Schult.	Dudali, Karanta	Indian Subcontinent to S. China and Indo-China	Apocynaceae	Climber	April- May	Latex, Fruit pods	Latex is used as nasal drops for clearing nasal passage in cough and cold
15	*Cymbopogon martini* (Roxb.) W.Watson	Ginger grass, Palmorosa grass	Indian Subcontinent to Indo-China	Poaceae	Grass	Whole year	Leaves	Leaves used in decoction for cough and cold.
16	*Cynodon dactylon* (L.) Pers.	Jub, Drub	Temp. & Subtropical Old World to Australia	Poaceae	Grass	Whole year	Leaves	Leaves paste is applied on the burnt area, leaves juice is used as nostril drops and leaves paste with buttermilk on head for nose bleeding during summer season in kinds and adults, leaves juice is also given for internal heat of the body as coolant
17	*Datura metel* L.	Dhatura	Texas to Colombia	Solanaceae	Herb	Whole year	Seeds,leaves, fruit,	Used in treatment of asthma, Bronchitis, ulcers, Seeds paste is used for rheumatism and arthritis, analgesic and anti-inflammatory, seeds also used for the drugs purpose by few people, leaves paste for bee and wasp stings,
18	*Dicliptera bupleuroides* Nees	Thorowax foldwing, Bouna	Afghanistan to S. Central China and Indo-China	Acanthaceae	Herb	Aug.-Sept.	Leaves	Leaves paste is applied on fresh cut and burnt wounds, it is also given for mental disturbance in human.

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
19	*Dioscorea bulbifera* L.	Tardi	Tropical & Subtropical Old World	Dioscoreaceae	Climber	March-April	Tubers	Tuber used in the treatment of Piles, dysentery, ulcers, cough, leprosy, diabetes, asthma, anti-inflammatory. Traditionally used as the abortifacient.
20	*Dioscorea deltoidea* Wall. ex Griseb.	Singali Mingali	Himalaya to Southern Central China and Indo-China	Dioscoreaceae	Climber	March-April	Tubers	Rhizomes used for the treatment of different diseases such as digestive disorders, sore of throat for Struma, diarrhea, irritability, abdominal pain, wounds, burns, anemia, etc.
21	*Euphorbia heterophylla* L.	Dudala	Central & Southren U.S.A. to Tropical & Subtropical America.	Euphorbiaceae	Herb	Summer and Rainy	leaves and latex	leaves for toothache, delayed for wounds healing
22	*Euphorbia hirta* L.	Lal Dudala	Tropical & Subtropical America	Euphorbiaceae	Herb	Summer and Rainy	leaves and latex	Traditionally leaves used for women menstrual disorders, leucorrhea, cough and cold, jaundice
23	*Girardinia diversifolia* (Link) Friis	Bhabbar	Tropical & Subtropical Old World	Urticaceae	Herb	Sept.-Oct.	Leaves	Sting is used for better blood circulation and numbness in body parts
24	*Gloriosa superba* L.	Kalihari	tropical and southern Africa and in tropical Asia	Colchicaceae	Climber	Aug.-Sept.	Rhizomes	Rhizomes are used as abortifacient and poison and treat leprosy and neural problems,
25	*Hedychium spicatum* Sm.	Ban Haldi, Satuli, Shanduli	Himalaya to S. Central China and Indo-China	Zingiberaceae	Herb	July-August	Flower and Rhizomes	Flowers and rhizomes used for skin problems, Rhizomes used in treating inflammation, pain, asthma, foul breath, vomiting, diarrhea, bronchitis, hiccough and blood diseases.
26	*Ichnocarpus frutescens* (L.) W.T.Aiton	Black creeper, Bakar bel,	Tropical & Subtropical Asia to N. Australia	Apocynaceae	Climber	April- May	Leaves, roots	Leaves used for the diabetes, bleeding gums and toothache, night blindness, dysentery, liver problems, jaundice and body pain, leaves decoction for the fever and skin irruptions. Roots used for the fever, dysentery, liver tonic
27	*Marsdenia roylei* Wight	Royle's Pergularia, Murba	NE. Pakistan to Myanmar	Apocynaceae	Climber	Feb.-June	Shoot	Stem juice is used for gastric troubles and stomach pain.

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
28	*Mentha piperita* L.	Pepera Pudina	Europe to Central Asia	Lamiaceae	Herb	Whole year	Leaves	Dried leaves used as flavoring in cooking, Fresh leaves used to cure indigestion and dehydration, to reduce body heat during summers.
29	*Mentha spicata* L.	Pahadi Pudina, Mentha	Europe to China	Lamiaceae	Herb	Whole year	Leaves	Leaves used to treat stomach problems like indigestion, acidity, it is also used to prepare traditional chatani.
30	*Micromeria biflora* (Buch.-Ham. ex D.Don) Benth.	Jungali ajwain	Afghanistan to S. Central China and N. Myanmar	Lamiaceae	Herb	Sept.-Oct.	Leaves	Leaves used in decoction for cough and cold and in tea.
31	*Nardostachys jatamansi* (D.Don) DC.	Mushkbala	Himalaya to W. & Central China and N. Myanmar	Caprifoliaceae	Herb	March-April	New shoots, roots	New shoots paste applied on burnt and cuts, roots used for fever, jaundice, liver problems, skin diseases, brain tonic, for pregnant women to produce healthy baby
32	*Oxalis corniculata* L.	Khatimithi	Mexico to Venezuela and Peru, Caribbean	Oxalidaceae	Herb	Summer and Rainy	Leaves	Leaves paste used for fresh skin cut, wounds and burnt areas
33	*Pogostemon benghalensis* (Burm. f.) Kuntze	Kali Basuti	Pakistan to Indo-China	Lamiaceae	Herb	Feb.-March	Leaves, Roots, Stems, Flowers	Roots and stem is used to cure cough and cold, Roots powder is given with milk for better health and immunity.
34	*Pueraria tuberosa* (Roxb. ex Willd.) DC.	Indian Kudzu, Salyanthan	Indian Subcontinent	Fabaceae	Climber	Whole year	Leaves, Tuber	Leaves used for wounds healing and fodder, tuber used as anti-inflammatory, health improver, neuroprotective, lactation enhancer, biomass enhancer, tuber used for jaundice
35	*Roylea cinerea* (D.Don) Baill.	Kadabo	W. & Central Himalaya to NW. India	Lamiaceae	Herb	Whole year	Leaves	Leaves used to cure diabetes, cuts, crushed leaves given to livestock in loss of appetite
36	*Rubia cordifolia* L.	Majishtha	Greece, Sudan to S. Africa, Asia	Rubiaceae	Climber	Summer	Roots	Roots used to treat menstrual problem for women, stomach problem, acne problem, toothache, blood purifier, fever, urinary problems, healing internal injuries

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
37	*Rumex hastatus* D.Don	Malora	Afghanistan to S. Central China and NW. India	Polygonaceae	Herb	April-July	Leaves	Leaves are crushed for making Chatani to provide cooling effect, crushed leaves applied for burnt, Improve digestion
38	*Senna tora* (L.) Roxb.	Senna	Central America	Caesalpiniaceae	Herb	Sept.-Oct.	Leaves and seeds	Leaves and seeds used as laxative, liver tonic and expectorant
39	*Setaria italica* (L.) P.Beauv.	Kavani, Faxtail millet	Cultigen from China	Poaceae	Grass	Sept.-Oct.	Seeds	Seeds are edible to improve health and to reduce blood sugar and cholesterol
40	*Sida cordifolia* L.	Khareti, Bala, Flannel Weed, Heartleaf sida	Tropics & Subtropics	Malvaceae	Herb	Summer	Roots and leaves	Roots used for the skin numbness, nerve disorders, muscle cramps, skin disorders, tumors, joint pain, healing wounds, ulcers, scorpion sting, snakebite. Leaves used to treat bronchial asthma, tuberculosis, colds.
41	*Sinocrassula indica* (Decne.) A.Berger	Nunu	W. Himalaya to China	Crassulaceae	Herb	Whole year	Leaves	Leaves paste is used to cure burnt wounds and feet heating feeing during summer.
42	*Solanum nigrum* L.	Black nightshade	Temp. Eurasia, Macaronesia, N. & NE. Tropical Africa	Solanaceae	Herb	Aug.-Sept.	Fruits, leaves	Antiperiodic, diuretic, sedative, purgative, stimulant, analgesic, alterative, aphrodisiac, laxative, headache and ringworm, Association with bad evil spirit.
43	*Stephania rotunda* Lour.	Bishkhapra	Indian Subcontinent to S. Tibet and Indo-China	Menispermaceae	Climber	Feb.-June	Tubers	Tuber is used to treat diabetes, fever, jaundice and dysentery. Tubers also given to cattle for better health and increase in milk production.
44	*Taraxacum* sect. *Taraxacum* F.H.Wigg.	Common dandelion, Dudli	Europe	Asteraceae	Herb	Feb.-June	Roots and leaves	Leaves used to treat stomach problems, fever and diabetes, roots and leaves used to improve milk flow in females,
45	*Thalictrum foliolosum* DC.	Pilli jadi	N. Pakistan to N. & E. Central India and China (Sichuan, Yunnan)	Ranunculaceae	Herb	Summer and Rainy	Roots	Roots used to cure jaundice by local people.

S.N.	Scientific name	Common / Local name	Nativity / Endemism	Family	Habit	Month of availability	Parts used	Method of uses
46	*Thymus linearis* Benth.	Ban ajwain	N. Iran to Xinjiang and Himalaya	Lamiaceae	Herb	Whole year	Leaves	Leaves used as decoction in cough and cold, leaves used as flavoring agent in food
47	*Thymus mongolicus* (Ronniger) Ronniger	Ban ajwain	Siberia to China	Lamiaceae	Herb	Aug.-Sept.	Leaves	Leaves used as condiments, leaves used for the decoction for cough and cold
48	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson	Giloye, Gulajo	Indian Subcontinent to Indo-China	Menispermaceae	Climber	Whole year	Stem	Chopped stem is given for the cow for better milk production and better digestion, stem is used for better digestion, to cure piles, diabetes, fever, blood purifier. Stem paste is given for Basaun disease (Tooth loosening and loss of appetite) in animals
49	*Urtica dioica* L.	Bichubuti, Bhabar, chin	Europe to Himalaya	Urticaceae	Herb	Dec.-Jan.	Leaves	Leaves sting used for better blood circulation and joint pains, leaves given to cow used to enhance the milk production
50	*Vincetoxicum hirsutum* (Wall.) Kuntze	Terni	Indian Subcontinent to Taiwan and Peninsula Malaysia, W. Jawa	Apocynaceae	Climber	April- May	Leaves	Leaves used for the diabetes, liver problems, jaundice and body pain
51	*Viola canescens* Wall.	Banaksha	NE. Pakistan to W. India and Assam	Violaceae	Herb	March-April	Flowers	It is used as antipyretic, diuretic, as decoction in cough and cold (flowers + honey and jiggery + black pepper + Tulasi + Ginger + salt + Harad + Turmeric rhizome/ powder+ Large cardamom+ Azwain),

Conclusion

The people of Majathal Wildlife Sanctuary have great Traditional Knowledge about healing plants. A number of plant species are used in home-based remedies to treat various ailments that can support the livelihood of the resident communities. Knowledge about traditional uses of plant species among the younger generation is a subject of concern which indicating towards the social barriers in the transfer of such valuable knowledge from one generation to another. The present documentation would be helpful to preserve the local Traditional Knowledge of medicinal plants and could be promoted by linking with ecotourism in the region. Participatory management and conservation planning can be initiated in the area to conserve valuable biological resource and betterment of the local people.

Author Contributions

Both the authors were actively involved in basic research structure development, research designing, methodology adoption, defining of intellectual content, benefit to society, and literature research. Krishna Kumari collected and analysed data, and prepared manuscript. Dr. R. K. Verma edited and reviewed the manuscript. Krishna Kumari, as a corresponding author, is the guarantor for this article.

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Figure 6: Some important medicinal plant from the Majathal Wildlife Sanctuary, **A.** *Viola canescens* Wall., **B.** *Tinospora cordifolia* (Willd.) Hook.f. & Thomson, **C.** *Rumex hastatus* D.Dont, **D.** *Sinocrassula indica* (Decne.) A.Berger, **E.** *Euphorbia heterophylla* L, **F.** *Setaria italica* (L.) P. Beauv., **G.** *Bergenia ciliata* (Haw.) Sternb., **H.** *Valeriana jatamansi* Jones, **I.** *Dioscorea bulbifera L.,* **J.** *Gloriosa superba* L., **K.** *Dioscorea deltoidea* Wall. ex Griseb., **L.** *Hedychium spicatum* Sm.