

Study of Plant Diversity in and around Central University of Himachal Pradesh TAB Campus, Shahpur and its Medicinal Uses

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Abstract: Himachal located in the region of famous biodiversity hotspot - The Himalayas; is home to various economically and medicinally important plant species. Complete documentation of the plant diversity from each geographical location is necessary to unravel the natural diversity prevailing in that location, its distribution and to devise strategies for the conservation of threatened plant species. It also helps in mitigating the threat to biodiversity loss due to its unsustainable utilization by local village communities. Temporary academic block (TAB) campus of Central University of Himachal Pradesh (CUHP) is located on the Mandi-Pathankot highway near a village called Chhatri. This is the first report of a study of plant diversity present in and around university campus through floristic diversity surveys conducted between January, 2019 to November, 2019, preparation of herbaria of plant samples and their identification through android smart mobile-based apps, local names and with the help of scientific staff of the CSIR-IHBT. We collected 125 plant samples, both cryptogams and phanerogams belonging to a total of 56 different families. Most prominent family prevailing in the location were Poaceae among monocots while Asteraceae among dicots. There was predominance of herbaceous plant samples with leaves being the most used plant part for the majority of plant samples.

Index Terms: CUHP, PictureThis app, plant diversity, medicinal plants, random sampling method.

I. INTRODUCTION

Plant diversity can be defined as the different species of plants growing in a given area. Plants are an important factor in a habitat as they provide structure, food and shelter, thereby contributing in overall the biodiversity of a site. These include herbs, shrubs and trees belonging to Bryophytes (mosses, liverworts and hornworts), Pteridophytes (ferns) and different

species of flowering plants. The plant diversity is total species of plants in a habitat and the variability within them. Plants find many ways to exist in a variety of environments. They can adapt to different environmental conditions and spread to different areas of the world and compete with other plants for their existence. Plants adapt themselves for different types of biotic and abiotic factors such as temperature, soil, extreme low temperature, daylight hours, method of pollination, altitude, competition with other plants etc. The list is endless. Plant species present in one habitat differ from one another in having different genetic makeup (Gaujour *et al.*, 2012).

Evolution plays key role in the development of new plant species from existing ones. Plants play important evolutionary role in the development of habitat and succession of species in an area. From the evolutionary perspective, unicellular photosynthetic life forms originated on earth. They brought necessary changes in a habitat for the growth of other non vascular plants such as algae, fungi and Bryophytes (liverworts, hornworts and mosses). Further, species variation and evolution occurred leading to the formation of primitive vascular plants such as Pteridophytes. These are a kind of woody cryptogams bearing reproductive organs such as male cones and female cones. During the end of the Devonian period, all plants possessed naked seeds. Further evolution in these woody plants led to the formation of present day flowering plants with seeds inside ovary. By the end of the Devonian period, all different varieties of plants got evolved (Bonacorsi *et al.*, 2020; Kenrick *et al.*, 1997).

A. Needs to Study Plant Diversity:

1) Most of the life forms on earth cannot exist without plants.

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2) Through exploration of field studies, we would know how many species are rare.

3) Plants are very useful in educational studies to understand various aspects such as ecology, environment, diseases caused by pathogens, etc.

4) It gives information on the number of medicinal plants present in a habitat and whether they require any protection.

B. Major threats to plant diversity:

1) Climate change: - Plants are the most affected due to climate change as the latter inhibits plant growth. Due to anthropogenic activities, climate gets changed which affects plant growth, reproduction, phenology and distribution of plants (Sintayehu, 2018). The emission of the greenhouse gases, i.e. chlorofluorocarbon (CFCs), methane, water vapour, carbon dioxide (CO₂), nitrous oxide (N₂O), ozone (O₃) etc. causes global warming and in turn leads to the climate change that affects the living organisms in that area.

The pathologists observe the role of environment in the development of diseases and its impact on microbe-host interaction. Agriculture is one of the most sensitive to global warming-mediated change in sea level, humidity, soil moisture, atmospheric temperature, precipitation, etc. An increase in the temperature causes the vapour pressure deficit of the air. As a result, there is an increase in transpiration rate, which has an adverse effect on plant, especially on dry area (Velasquez *et al.*, 2019).

2) Over exploitation:- Many plant species are used as medicines to treat diseases in traditional practices. Over exploitation of plants used in resource extraction such as compound elements, secondary metabolites and other practices cause their extinction.

3) Diseases: The growing of crop plants in monoculture practices poses threat of plant pathogens becoming virulent in nature causing more diseases and devastations. The effect could range from mild symptoms to catastrophes destroying large areas of crops. So the infected plants may die posing a huge economic loss.

4) Habitat loss:- Habitat of flora gets destroyed either due to natural fire or by human activities such as sudden fire, deforestation for human needs leading to increased loss of plant diversity.

5) Overgrazing:- Plant diversity is lost by overgrazing of plants from animal.

C) Need for plant conservation:

1) Protection: Plants are necessary for all animals and human life; people recognized both cultivated and wild plant species for the development and human survival. Plant conservation takes action for many purposes that are in research, seed

banking restoration, education and natural area management. In our planet plants are very important for the supply of oxygen for breathing. Plant roots prevent the soil erosion. Plants consume solar energy for photosynthesis: formation of food. Plants are primary producers of the food chain. Plants provide many raw materials that are medicines, fibre, food, clothes, rubber, paper, clothing and many other products that sustain our life. Plants enhance the beauty and quality in our surroundings. The trees, shrubs, and herbs, are used as ornamental species; these plants are the major parts of the world economy (CBD report, 2009).

2) Preservation: Preservation is required to ensure sustenance of plant species through various *in situ* and *ex situ* methods as well as preserving in the form of herbaria for scientific research. The plant specimens are collected, mounted on papers for herbarium preparation. These collections are used for future identification of plants. *Muséum national d'Histoire naturelle* located in France is the largest herbarium in the world (Le Bras *et al.*, 2017). The endangered plant species are preserved through *in-situ* and *ex-situ* methods so that they will not get extinct from our natural habitat. Micropropagation of endangered plants is carried out through *in-vitro* plant tissue culture methods for the formation of more plantlets which are planted in *ex-situ* conservation areas. We also protect large areas of land naturally rich in plant species diversity as biosphere reserves (Oseni *et al.*, 2018).

Due to global warming and climate change, there is an increasing pressure on the flora and fauna to adapt to this rapidly changing environment apart from various threats from existing anthropogenic activities (Agrawal, 2011). It is necessary to conduct plant diversity exploration studies to enlist all the different types of species present in an area. Such studies will be a basis for providing protection and conservation to any endangered plant species prevailing or endemic to that particular area of study.

The present study was undertaken to study the plant diversity naturally present within ~1.5 km radius around the Temporary Academic Block (TAB) campus of CUHP, Shahpur, District-Kangra H.P. Exploration of the area on foot, selection of different habitats as sites for diversity studies, collection, preservation and identification of the plant samples were carried out for the present study. To the best of our knowledge, this is the first floristic diversity study around the TAB campus of CUHP which will be very useful for the future students to conduct taxonomical and ecological studies on plant sciences.

II. MATERIALS AND METHODS

A. Area under study:

An area of ~1.5 km radius around TAB campus of Central University of Himachal Pradesh (CUHP) near Shahpur was undertaken for the study of plant diversity. The approximate GPS location of TAB campus is 32.224501071188946 (latitude) x 76.15665793418886 (longitude) with an elevation of ~778m. The map of the area

under study is shown in (Fig. 1). The GPS data of all the collection sites are presented in Table I.

The plant specimens were sampled by random sampling method (Diekmann *et al.*, 2007), photographed, preserved and identified. The unknown specimens were labelled as a, b, c, d, e, and so on. This was followed by the preparation of herbarium of plant samples.

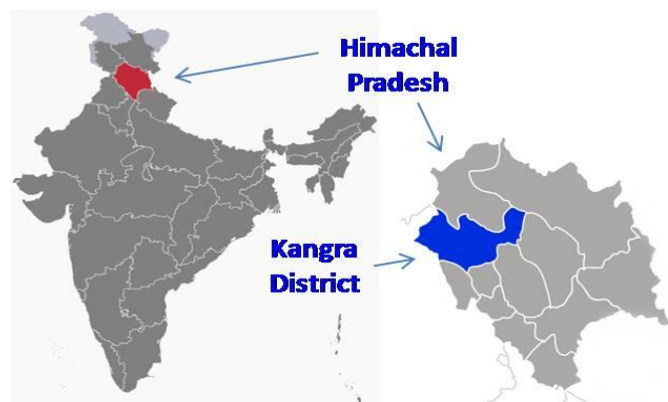


Fig. 1: Map of the study area. The floristic diversity was sampled within ~1.5 km radius area around Temporary Admin Block (TAB) campus of CUHP, Shahpur, District-Kangra, H.P.-176206 (Images are taken from 'https://en.wikipedia.org/wiki/Himachal_Pradesh' and google maps - 'https://en.wikipedia.org/wiki/Kangra_district').

The climate of the study area falling within the Kangra district is described as 'Cwa' (monsoon-influenced, Humid Subtropical climate) as per Köppen-Geiger climate classification system (<https://en.climate-data.org/>) showing the classic dry winter/wet summer pattern. The average annual temperature is 19.1°C with average annual rainfall of 1,751 mm. The region is filled with deciduous forest. The elevation of the place ranges from 681.15 m to 844.25 m as the Height of straight line (HSL) or Height above ellipsoid (HAE). The region falls within the category of outer-hill soil zone present

in Kangra district. The soil is alluvial and sandy in nature, rich in clay and organic matters besides having pebbles, gravels and stones.

B. Floristic Dissertation trips/tours:

A total of 17 dissertation trips between January 2019 to November 2019, were carried out by the group within the entire study area covering different landscapes such as plain fields, grasslands, hillocks, runoff water trails (khuds) etc.

C. Picture collection:

Before the collection of plant samples, we took pictures in their natural habitat conditions. These pictures were used later for android mobile-based apps for identification of the plant samples. After collection, we spread the plant sample on a piece of paper sheet and took another picture for record purpose.

D. Collection of plant specimens FOR Herbarium preparation:

The plant materials were selected carefully in the field. We did not collect any species that are endangered and rare. In most cases, a part of the plant was collected with minimal damage to the plant. In those cases where the plant was prevalent in the area, we sampled whole plants. In case of non-prevalent species, we took photographs of that plant, wrote the descriptions and made a diagram. The plants were collected with roots by digging it up using the pruning apparatus and placed in a separate cover and numbered. The aquatic plants were sampled carefully as sometimes these plants were too delicate. The collection details such as date, place, collected by, important plant characters were noted down. The specimens were collected, pressed in newspapers and preserved as per standard botanical herbarium preparation methods and later herbarium was prepared (Goswami S, www.biologdiscussion.com).

Considerations before making a plant collection are:

- 1) Selection of the plant with mature parts (flower, fruits, leaves, roots and stem).
- 2) Selection of plant in good condition that is free of diseases.
- 3) Selection of a plant sample which shows variation in the population, a collection of small or enough part of the plant to fill a standard sheet (30 x 42 cm) of the herbarium.
- 4) Collection of only single species from one locality.
- 5) Collection of extra fruits and flower for discussion.
- 6) Collection of leaves, flower, stem, herbaceous plants, catkin of tree and shrubs.

E. Identification of plant samples:

1) Identified by local names:

We were familiar with the local names of a number of plant specimens and sometimes we took help of the local people to know the names and uses of the plant samples. From the local names, we could easily search the botanical names of the plant samples from the internet.

2) Preliminary identification through mobile Apps:

Most of the plant samples were identified primarily through android mobile-based apps such as PictureThis-Flower & Plant Identification app (www.picturethisai.com) which aids in the reliable identification of the plants in majority of the cases and up to the genus level for some plants. This app has a database of several plant part pictures in different angles for a given plant sample. It uses artificial intelligence to process the pictures and gives three suggestions. We received several plant details such as botanical names, family details, common names and images through this app. However, there were also false identifications in a few cases and for those samples, a detailed study was undertaken.

3) Final identification:

The plants were identified based on a combination of morphological and floral characters such as inflorescence, flower type, leaf morphology, leaf arrangement, etc. For the species level identification, we relied on previous publications describing the plants reported from this region or near to this region of Himachal Pradesh. The final confirmation or the species level identification of plants was done with the help of Mr. Om Prakash and Dr. Sanjay K. Uniyal from Environmental Technology Division of Institute of Himalayan Bioresource Technology (IHBT), Palampur, Himachal Pradesh. They helped us in the final confirmation of the botanical names of the plant specimens collected and correction of species level identification of the samples. They also identified some of the plant specimens which remained unidentified by us during our study.

III. RESULTS

A. Floristic Diversity:

Majority of the plant samples were identified by us with the help of local names; android-based mobile apps and previously reported articles while the remaining plant samples were identified with the help of IHBT staff members. A total of 125 different plant samples belonging to 114 genera and 58 families were collected during different dissertation trips. The total list of all plant species collected during this diversity study, their common names, family details and their important medicinal uses are listed in Table II.



Fig. 2: Plants identified through local names. A number of plants were identified through their local names during interaction with villagers. A few such plants are shown above.

B. Ethnobotanical information of plants collected from villagers:

A number of plant samples were collected and identified during several dissertation trips based on their local names as local people are very well familiar with these plants from Himachal Pradesh (Fig. 2). The local names and scientific names of some of these plants are Galgal (*Citrus pseudolimon*), Meenaki ke patte (*Centella asiatica*), Aakhe (*Rubus ellipticus*), Teermeera (*Zanthoxylum alatum*), Charmara (*Artemisia nilagirica*), Panchphuli (*Lantana camara*), Sathu bathu (*Chenopodium album*), Berseem (*Trifolium alexandrinum*), Maroli (*Oxalis corniculata*), Banna

(*Vitex negundo*), Gandhela (*Murraya koenigii*), Garnu (*Carissa spinarum*), Ban (*Quercus latifolia*), Bhang (*Cannabis sativa*), Basuti (*Justicia adhatoda*), Sanspa (*Asparagus adscedens*), Kainth (*Pyrus pashia*), Pudina (*Mentha piperita*), Bichu buti (*Urtica dioica*), Doodhia (*Euphorbia helioscopia*), Lamb (*Bidens pilosa*), Basanti ke phul (*Reinwardtia indica*), Neelakanta (*Duranta erecta*), and Kyouin (*Vicia faba*). During our dissertation trips, we met with several villagers who were keen to know about our work. By interacting with these local people, we gathered information on ethnobotanical and medicinal uses of these plants.

In the village Dramman, we collected a plant called Charmara (*Artemisia nilagirica*) as is known by the local people and they told us that it is used to kill mosquitoes. The parts of the plant are also used for treating skin problems.

In the village Dadroli where we met two locals named as Sudesh Kumari and Suman, who gave us information about the Meenaki ke paate plant (*Centella asiatica*) (Fig. 4b). They told us that they took two leaves of this plant with almonds to boost memory. This plant is mostly used by children or old aged people.

From the Upperla bhaniar village near by HIET Institute, we collected the plant galgal (*Citrus pseudolimon*). The fruits of this plant are used to make pickles and are also used to cure cough and cold etc.

We also collected Sathu Bathu (*Chenopodium album*) from Chattri village. The leaves of this plant are cooked as a vegetable (saag) and the seeds are used to make chicken curry. Due to the presence of vitamin A, it is very useful for the pregnant ladies.

Pudina (*Mentha piperita*) (Fig. 2c) was collected from village Jaladii. It is also edible and used to make chutney. It is useful in case of stomach related disorders.

Garnu (*Carissa spinarum*) (Fig. 2f), a plant collected near the University canteen is basically used for its seeds which are eaten by the people as the seeds have chewing property.

Kainth (*Pyrus pashia*) was collected near Prakash PG hostel, Upperla Bhaniar. Its fruits are edible and have good taste. Its wood is used as fuel.

Banna (*Vitex negundo*) was collected near Ajay Dhaba, Chattri. It is used for occult practices (jhadd fukk) and it is believed that its leaves are used to cure jaundice. The plant has anti-venom properties and it is used as an insect repellent. Its stem part is used to clean teeth (locally called as dattun).

Neelkanta (*Duranta erecta*), a plant collected within CUHP campus is used for biofencing purposes and is used to cure fevers, skin itches and also as an insect repellent.

Gandhela (*Murraya koenigii*) was collected from Upperla Bhaniar village. It is also named as curry patta plant and is used for culinary purposes. The paste of the leaves of this plant is used on swollen part of the body and it gives relief. Its stem part is used to clean teeth (dattun purposes).

In the village Dadroli, we collected Panchphuli (*Lantana camara*) which is regarded as a poisonous plant by some local people. However, there are also reports claiming that the fruit is edible.

C. Unidentified plant samples:

Two plant samples collected during the diversity study remained unidentified. We assigned them as Sample A and Sample B respectively (data not shown). Further detailed study of these plant samples will be carried out in future.

IV. DISCUSSION

Out of the total of 125 plant samples collected, 09 were cryptogams (01 Algae, 04 Bryophytes, 04 Pteridophytes) and 116 were phanerogams including 01 Gymnosperms and rest 115 being Angiosperms (08 monocotyledons and 107 dicotyledons).

A number of cryptogamic plants were sampled during this study, including algae, lichens, *Marchantia* sp., *Selaginella* sp., *Dryopteris* sp., *Adiantum* sp., *Equisetum* sp. etc (Fig. 3). Among monocotyledons, the most prominent families were Poaceae (06 genera and 06 species), followed by Asparagaceae (01 genera and 01 species), Orchidaceae (01 genera and 01 species) etc.



Fig. 3: Different Cryptogamic plants collected around TAB campus, CUHP.

Among dicotyledons, the most represented families in this region were Asteraceae (12 genera and 12 species) followed by Lamiaceae (09 genera and 10 species), Fabaceae (07 genera and 07 species), Polygonaceae (06 genera and 06 species), Euphorbiaceae (05 genera and 05 species), Amaranthaceae (05 genera and 05 species), Acanthaceae (04 genera and 04 species), Verbenaceae (03 genera and 03 species), etc. (Fig. 4).

A total of 34 families remained monospecific and were represented with only one species from the study area, such as members from Menispermaceae, Cannaceae, Mazaceae and Cannabaceae. The family-wise distribution of plants is shown in bar diagram (Fig. 5) illustrating the most dominant and least prevalent families. The plant samples can be categorized

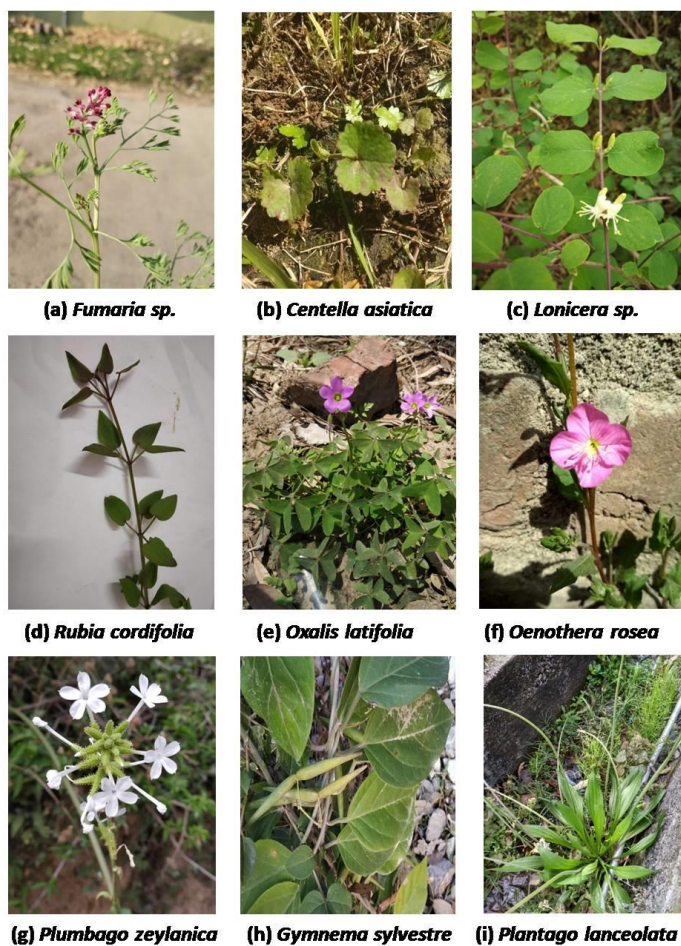


Fig. 4: Different Phanerogamic plants collected around TAB campus, CUHP.

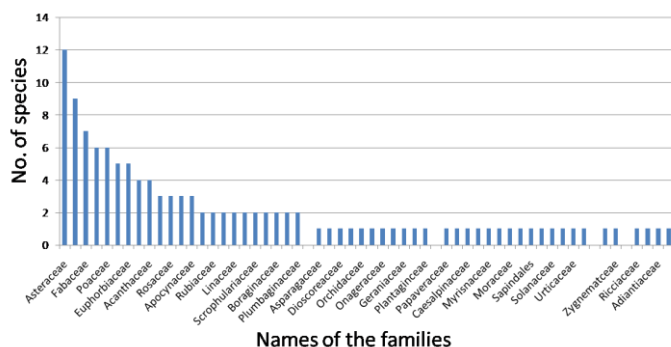


Fig. 5: Bar diagram representing the dominance of different families in the study area around TAB Campus, CUHP.

into herbs (63%), shrubs (13.5%), trees (6.5%), climbers (6.5%) etc. (Fig. 6) and we have sampled the majority of herbal plant samples. We also sampled plants such as epiphytes (*Vanda sp.*), ecological indicators (*Equisetum ramosissimum*), climbers (*Clematis sp.*) and parasitic plant (*Cuscuta reflexa*) growing on different host species (Fig. 7).

We categorized these 125 plants based on the plant part used for various medicinal purposes (Fig. 8). Leaves are the

most prominent plant part (23%) used for medicinal purposes for the majority of plant samples followed by root (15%), stem (14%), flowers (11%), seeds (11%), fruits (10%) whole plants (9%) and others.

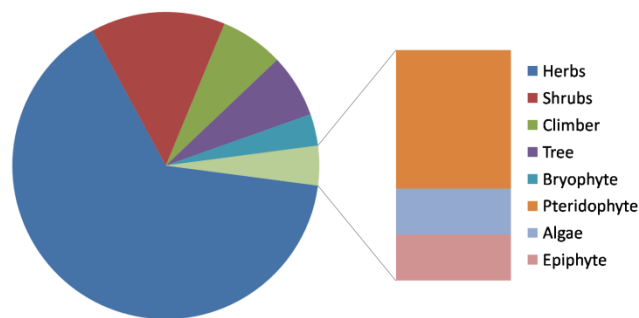


Fig. 6: Categorization of plant samples into different categories based on the habit of the plants.

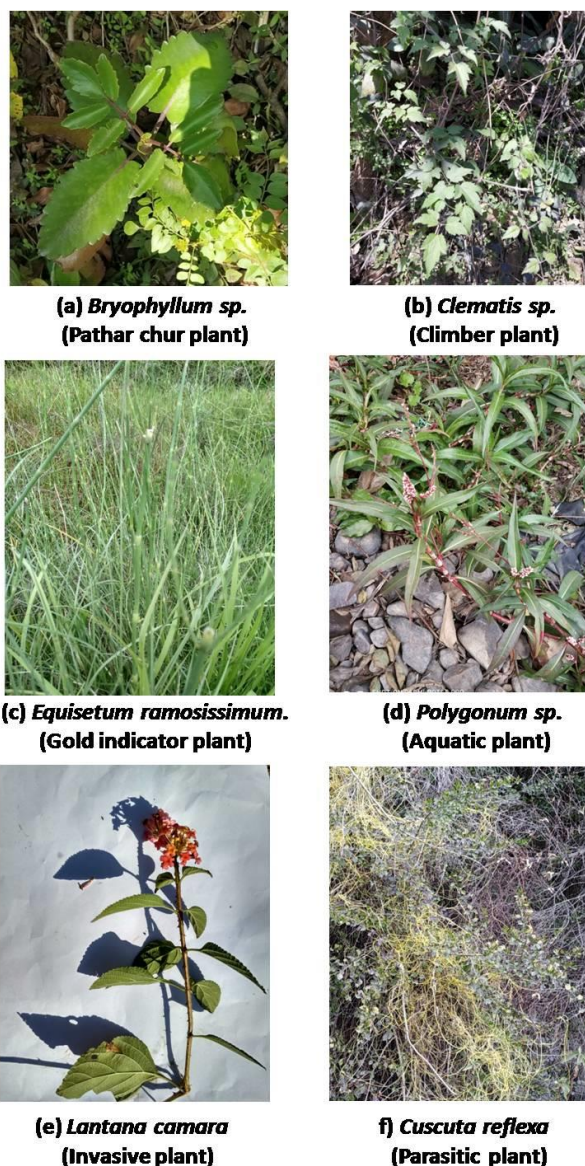


Fig. 7: Ecologically important plants identified during this study.

These medicinal plants are used to treat various ailments and diseases. The majority of the plant samples collected during our study are used to treat ailments such as fever (17%), cold (15%), skin diseases (11%); and showing anti-inflammatory (6.5%), anti-tumor (5.4%), anti-ulcer (6.4%), anti-diabetic (4%) effects (Fig. 9).

Our sampling area was also filled with a number of weeds. Some of the well known prevalent weed samples included *Parthenium hysterophorus*, *Lantana camara*, *Stellaria media*, *Bidens pilosa*, *Veronica persica*, *Cynoglossum glochidiatum*, *Alternanthera sessilis*, *Capsella bursa-pastoris*, *Trifolium repens*, *Cannabis sativa*, *Rumex nepalensis*, *Rumex hastatus*, *Cirsium* sp., and *Sida rhombifolia* etc.

In our study, we found the plant sample- *Centella asiatica* (Fig. 4b) to be prevalent in the area mostly in the wet soils though it was reported as a threatened species by some reports (Singh *et al.*, 2010).

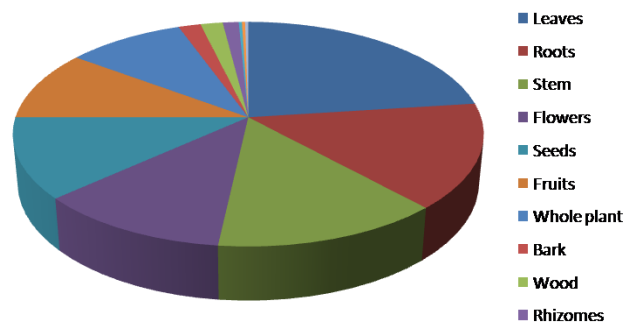


Fig. 8: Categorization of different plant parts based on its use in various medicinal purposes.

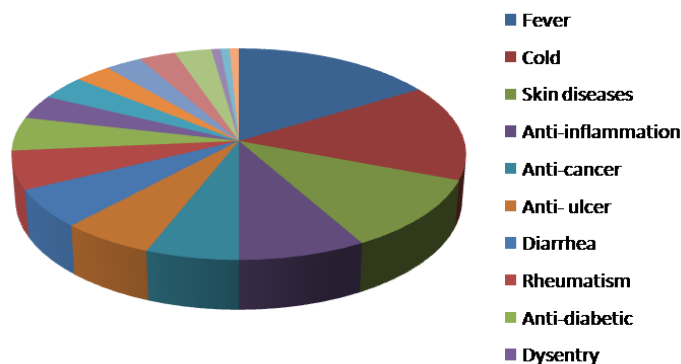


Fig. 9: Pie chart showing different diseases which are treated using various medicinal plant samples collected during this study.

CONCLUSION

The study area around TAB campus, CUHP is rich in plant diversity with members belonging to Algae, Bryophytes, Pteridophytes, Gymnosperms, herbs, shrubs, trees, climbers, epiphytes, parasitic plants etc. A total of 125 distinct plant species was studied which belonged to 114 genera and 58 families. The majority of these plant samples were herbaceous

members. Most of these plant samples are medicinally important and some of these are in ethnobotanical use. One of the plant samples- *Centella asiatica* though prevalent here is sometimes reported as a threatened species in some regions. The present study illustrates the plant sample identification and floristic diversity study with the aid of android mobile-based apps such as PictureThis which uses recent technological advancements such as artificial intelligence to suggest scientific names with images of plants. Such apps can be very useful for students, farmers and staff members with minimum or no taxonomical knowledge for quicker plant identification. With the present situation of decreasing number of qualified taxonomists, an integration of classical morphological features, molecular DNA-based markers and android mobile app-based identification hold promise in generating interest of next generation technologically smart students in taxonomical studies.

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Table I: GPS data of the different plant sample collection sites around TAB Campus, CUHP.

Landmark	Towers	Latitude	Longitude	HSL m HAE	Distance resolution	PDOP	mPD OP	Min Elevation	Min SNR
HIET (H1)	5	32.22380361	76.15888889	767.9 m	12 m	4.33	99.0	5°	12.0
In-front of HIET (H2)	6	32.22377528	76.15944444	780.31 m	9.3 m	2.16	99.0	5°	12.0
Vidyanagar (H3)	7	32.22215361	76.16055556	757.12 m	8.2 m	2.16	99.0	5°	12.0
(H4)	9	32.22118028	76.16194444	776.31 m	7.8 m	1.44	99.0	5°	12.0
(H5)	9	32.22046972	76.16305556	722.23 m	8.3 m	1.44	99.0	5°	12.0
Farmer's House (H6)	8	32.21976778	76.16333333	742.47 m	5.5 m	1.44	99.0	5°	12.0
Ahead of Farmers' house (H7)	8	32.21789278	76.16305556	731.89 m	6.1 m	1.44	99.0	5°	12.0
Temple (H8)	9	32.22362333	76.15555556	735.54 m	6.9 m	1.44	99.0	5°	12.0
CUHP Entrance (H9)	9	32.22432056	76.15638889	737.21 m	11 m	2.16	99.0	5°	12.0
CUHP Left (H10)	7	32.22434333	76.15666667	739.46 m	8.2 m	1.44	99.0	5°	12.0
CUHP Canteen (H11)	8	32.22475222	76.15694444	728.75 m	5 m	1.80	99.0	5°	12.0
CUHO Right (H12)	8	32.22434333	76.15694444	736.55 m	5 m	1.44	99.0	5°	12.0
CUHP center (H13)	8	32.22445667	76.15666667	773.971 m	8.2 m	1.80	99.0	5°	12.0
Draman (D1)	4	32.22711472	76.15777778	744.34 m	7.9 m	2.88	99.0	5°	12.0
Farmers field (D2)	5	32.22783222	76.15888889	748.14 m	7.5 m	2.16	99.0	5°	12.0
Petrol pump (D3)	5	32.22798139	76.16388889	803.39m	11 m	3.61	99.0	5°	12.0
Gaurav's House (D4)	6	32.22808694	76.16583333	815.23 m	8.4 m	3.24	99.0	5°	12.0
Draman bus stop (D5)	6	32.22739472	76.16888889	844.25 m	9.6 m	3.24	99.0	5°	12.0
University shortcut, Manjhgram (D6)	8	32.22671833	76.16166667	801.89 m	8.1 m	4.33	99.0	5°	12.0
Near foot hill (D7)	9	32.22510167	76.16000000	756.38 m	8.2 m	4.33	99.0	5°	12.0
Chattri school (C1)	6	32.22455528	76.15194444	729.89 m	9.2 m	3.61	99.0	5°	12.0
Chattri river (C2)	6	32.22231667	76.14750000	681.15 m	6.3 m	3.24	99.0	5°	12.0
Plain field (C3)	7	32.22091667	76.14944444	708.34 m	6.3 m	2.16	99.0	5°	12.0
Pathania PG (C4)	8	32.21970972	76.15166667	706.97 m	5.6 m	1.44	99.0	5°	12.0
Near well in field (C5)	8	32.22114278	76.15277778	712.12 m	5 m	1.44	99.0	5°	12.0
Near bend of road (C9)	8	32.22271667	76.15527778	727.41 m	7.2 m	1.44	99.0	5°	12.0

Table II: The total list of all plant species collected during diversity study, their common names, family details and their important medicinal uses.

Sl. No.	Botanical name	Family	Common Name	Part used	Medicinal use
Cryptogams/Algae					
1	<i>Spirogyra sp.</i>	Zygnemataceae	Blanket Weed	Whole part	Role against oxidative damage and anti-ageing.
Cryptogams/Bryophytes					
2	<i>Funaria sp.</i>	Funariaceae	Cord moss	Whole plant	Used to treat pulmonary tuberculosis, hemostasis and skin infections.
3	<i>Marchantia sp.</i>	Marchantiaceae	Umbrella liverwort	Whole plant	It is anti-pyretic and diuretic. Used to treat skin tumefaction, hepatitis; flavonoids from <i>Marchantia</i> are used against typhoid bacillus, <i>Staphylococcus aureus</i> .
4	<i>Polytrichum sp.</i>	Polytrichaceae	Haircup moss	Whole plant	It is antipyretic, wound healer antidotal purpose. Used to treat homeostasis, dissolve stones from kidney and gall bladders, facilitates labor process at the time of child birth.
5	<i>Riccia sp.</i>	Ricciaceae	Floating crystal wort	Whole part	Used to treat ringworm, tympanitis, tonsillitis, cardiovascular diseases, cystitis, bronchitis etc.
Cryptogams/Pteridophytes					
6	<i>Adiantum sp.</i>	Adiantaceae	Walking hair fern	Leaves	Used to treat fever and acute bronchitis. The fronds of the fern are useful for cough, cold and mouth blisters.
7	<i>Dryopteris sp</i>	Dryopteridaceae (Wood Fern Family)	Wood fern	Fronds	It is potentially toxic. Used as antioxidant, antimicrobial and vermifuge.
8	<i>Selaginella sp.</i>	Selaginellaceae (Spikemosses Family)	Starry spikemoss	Whole plant	Used as diuretic and for treating gonorrhoea. Also used with tobacco for hallucinations.
9	<i>Equisetum ramosissimum</i>	Equisetaceae (Horsetail Family)	Horsetail	Stem, whole plant	It is antifungal, diuretic, antioxidant, CNS depressant, hepatoprotective and anti-proliferative.
Phanerogams/Gymnosperms					
10	<i>Pinus roxburghii</i>	Pinaceae (Pine Family)	Chir	Seed, Resin, Needles.	Turpentine from pine trees is diuretic, antiseptic, vermifuge, rubefacient and used for coughs, colds, kidney and bladder complaints, to treat TB and influenza.
Phanerogams/Angiosperms/Monocotyledons					
11	<i>Asparagus adscendens</i>	Asparagaceae (Asparagus Family)	Satawari	Tuberous roots and rhizomes.	Increases vitality and strength when its powder is taken with milk.
12	<i>Vanda sp.</i>	Orchidaceae (Orchid Family)	Vanda Orchid	Roots	Roots are antipyretic and alexiteric; finds use against piles, bronchitis, dyspepsia, inflammation.
13	<i>Thysanolaena latifolia</i>	Poaceae (Grass Family)	Tiger Grass	Inflorescence	Antibacterial and antioxidant. Flower panicles are used as brooms.

14	<i>Oplismenus compositus</i>	Poaceae	The running mountain grass	Aerial parts	Used to treat snakebites.
15	<i>Cynodon dactylon</i>	Poaceae	Doob grass	leaves	It is astringent, antipruritic, demulcent, antiseptic, aperient, sudorific, depurative, emollient, diuretic, hypoglycemic, vulnerary and immunomodulative. Used to treat piles, constipation and menstrual problems.
16	<i>Briza media</i>	Poaceae	Quaking grass	Flowers, seeds.	No reported medicinal uses. Used for architecture, gardening, flower arranging, flower beds and borders.
17	<i>Paspalum vaginatum</i>	Poaceae	Seashore paspalum	Not reported	No reported medicinal uses. It finds use in phytoremediation, decreasing soil erosion, increasing soil binding.
18	<i>Imperata cylindrica</i>	Poaceae	Cogon grass	Flower, root,	Flowers and the roots are antibacterial, diuretic, febrifuge, styptic, sialagogue, and tonic. Used in wounds and haemorrhages.
Phanerogams/Angiosperms/Dicotyledons					
19	<i>Justicia adhatoda</i>	Acanthaceae (Acanthus Family)	Basuti	Root, leaf, fruit	It is anthelmintic. Used to treat cold, cough, asthma, pulmonary problems, fevers etc.
20	<i>Dicliptera bupleuroides</i>	Acanthaceae	Roxburgh's Foldwing	Whole plant, leaves, stem root.	It has antidiabetic and antimicrobial activities. Its poultice is useful for scabies.
21	<i>Thunbergia grandiflora</i>	Acanthaceae	Bengal clockvine	leaves	Leaves are eaten as vegetables.
22	<i>Lepidagathis cuspidata</i>	Acanthaceae	Bendya-ghas	Roots, Leaves	It is antifungal and antioxidant. Leaf powder is used on boils, wounds, blisters and mouth ulcers.
23	<i>Chenopodium album</i>	Amaranthaceae (Amaranth Family)	Bathu sathu	Whole plant	It is laxative, anthelmintic, contraceptive and odontalgic. Used to treat sunstroke and urinary problems.
24	<i>Chenopodium ambrosioides</i>	Amaranthaceae	Sathu bathu	Whole plant	Used as analgesic, carminative, antiasthmatic, vermifuge and stomachic.
25	<i>Chenopodium vulgare</i>	Amaranthaceae	Bathua	Leaf and shoots	Anthelmintic, odontalgic, contraceptive and laxative. Used to treat sunstroke, urinary problems.
26	<i>Amaranthus viridis</i>	Amaranthaceae	Slender amaranth	Leaves	Used to treat asthma, pain, fever and dysentery.
27	<i>Alternanthera sessilis</i>	Amaranthaceae	Dwarf copperleaf	Leaves flowers and stem	It is diuretic, cooling and laxative. It is used as herbal medicine and for dysuria and hemorrhoids.
28	<i>Centella asiatica</i>	Apiaceae (Parseley Family)	Minkee ke patte	Whole plant, leaves, roots.	Its leaves are memory enhancer.
29	<i>Hydrocotyl sibthorpioides</i>	Apiaceae	Water penny wort	Whole plant leaves, roots.	It has immunomodulatory, antiproliferative, anti-oxidant and hepatoprotective properties.
30	<i>Allamanda cathartica</i>	Apocyanaceae (Dogbane Family)	common trumpet vine	Bark, leaves	Used to treat jaundice, liver tumors and malaria.

31	<i>Catharanthus roseus</i>	Apocyanaceae	rose periwinkle	Whole plant, leaves, roots	It is antidiabetic. Used to treat wasp stings, in wounds healing.
32	<i>Gymnema sylvestre</i>	Apocyanaceae	Gurmar	Leaves	It is antidiabetic.
33	<i>Carissa spinarum</i>	Apocynaceae	Garnu	Fruit, stem bark and spines.	Used to treat acidity, indigestion and wound healing. Spines are used to remove needles accidentally inserted in body parts.
34	<i>Cirsium wallichii</i>	Asteraceae (Sunflower Family)	Wallichii thistle, Bursa	Root	It is antioxidant and antimicrobial. Root powder is used for headache, gastric problems.
35	<i>Artemisia sp.</i>	Asteraceae	Sweet annie	Leaves	Used to treat fever, malaria and to repel mosquitoes.
36	<i>Artemisia nilagirica</i>	Asteraceae	Charmara	Whole plant	It is diuretic. Used to treat for fever.
37	<i>Eupatorium adenophorum</i>	Asteraceae	Kali bansuti	Root, branch	It is anti-inflammatory and antifungal. Used to treat cold and cough.
38	<i>Taraxacum officinale</i>	Asteraceae	Kanphul	Whole plant	It is stomachic, hepatic, dropsy, stimulant and laxative.
39	<i>Ageratum conyzoides</i>	Asteraceae	Neelaphulnu, ukalbuti	Fresh leaves	Juice of fresh leaves heals wounds by clotting of blood.
40	<i>Bidens pilosa</i>	Asteraceae	Lumb, clumb	Whole plant	Used to treat ulcer, cough, ear trouble, eye problem and swollen gland.
41	<i>Sonchus wightianus</i>	Asteraceae		Root, leaves	Used to treat cough, asthma, Jaundice, bronchitis and swelling.
42	<i>Sonchus oleraceus</i>	Asteraceae	Sowthistle	Whole plant	Used to treat fever, eye problem, liver infection, <i>Salmonella</i> infection, general pain, inflammation, menstrual problem and rheumatism.
43	<i>Parthenium hysterophorus</i>	Asteraceae	Congress grass	Leaves, flowers, roots.	Used to treat neurologic disorders, diarrhea and urinary tract infections.
44	<i>Saussurea sp.</i>	Asteraceae	Kuth	Root	It is anti-inflammatory. Used as ointment for ulcers.
45	<i>Synedrella vialis</i>	Asteraceae	Straggler Daisy	Roots and leaves, flowers	Used to treat spermatorrhoea and painful urination.
46	<i>Cynoglossum glochidiatum</i>	Boraginaceae (Forget-me-not Family)	Hathi suda, Kandha.	Root	Root extract used in digestive disorders, dyspepsia, as aphrodisiac for treating male sexual dysfunctions and infertility.
47	<i>Bothriospermum chinense</i>	Boraginaceae	China spotseed	Entire plant	Used for detoxification, reducing swelling, eczema, infections.
48	<i>Nasturtium officinale</i>	Brassicaceae	Watercress	Leaves, flower, seed	Used to treat cough, bronchitis, cure urinary tract infections.
49	<i>Lepidium didymium</i>	Brassicaceae	Bitter Cress	Seeds	Anti-inflammatory. Used to treat cough, bronchitis, asthma, rheumatism.
50	<i>Cassia fistula</i>	Caesalpinaceae (Gulmohar Family)	golden shower/ Amaltas	Leaves, root, flower, fruit pulp, bark	Used to treat cold, cough, constipation.
51	<i>Cannabis sativa</i>	Cannabinaceae (Hemp Family)	marijuana	Whole plant	Used to treat nausea, muscle spasms and chronic pains.
52	<i>Canna indica</i>	Cannaceae	Sarvajjya	Whole plant	Used to treat gonorrhoea, dysentery, malaria and diarrhea.

		(Canna Family)			
53	<i>Stellaria media</i>	Caryophyllaceae (Carnation Family)	Chickweed	Leaf, stem	Used to treat pulmonary diseases and itchy skin rashes.
54	<i>Silene conoidea</i>	Caryophyllaceae	Large sand catchfly	Whole plant	It is fumigant. The juice from plant is used for ophthalmia.
55	<i>Cuscuta reflexa</i>	Convolvulaceae (Morning Glory Family)	Amar bel	Whole part	It is purgative and carminative. Finds use in skin diseases. Decoction of the stem is useful for constipation and liver problems.
56	<i>Evolvulus alsinoides</i>	Convolvulaceae	Dwarf morning glory	Whole plant	Used to treat syphilis, scrofula, common cold and general weakness.
57	<i>Ipomoea cairica</i>	Convolvulaceae	Japanese Morning Glory	Seeds, leaves.	Its seed is antifungal, anthelmintic, antitumor, anticholinergic, diuretic, antispasmodic and laxative. Used for constipation, ascariasis, oliguria and oedema.
58	<i>Dioscorea bulbifera</i>	Dioscoreaceae (Yam Family)	Bilaikand, tardi	Fruit, tuber	Used to treat skin disease, diarrhea, leprosy, cough, diabetes and abdominal pains.
59	<i>Euphorbia helioscopia</i>	Euphorbiaceae (Spurge Family)	Madwoman s milk	Leaves, stem, root and seeds	It is anti-periodic, febrifuge and vermifuge.
60	<i>Euphorbia thymifolia</i>	Euphorbiaceae	Chhoti Duddhi	Leaves and seeds	Used to treat bowel problems, ringworm and female disorders.
61	<i>Mallotus philippensis</i>	Euphorbiaceae	Kamal		It is anthelmintic. The dye is used for herbal medicines.
62	<i>Ricinus communis</i>	Euphorbiaceae	Castor oil plant	Root, leaf, Seed, Oil	Used to treat furuncles, rheumatism and worm infestation.
63	<i>Euphorbia hirta</i>	Euphorbiaceae	Asthma plant	All parts of plant	Used to treat cough, asthma, bronchitis, pimple and jaundice.
64	<i>Vicia sativa</i>	Fabaceae (Pea Family)	Garden vetch	Seeds,	Seeds are powdered to make flour which is used in preparing biscuits, breads etc. It also fixes nitrogen.
65	<i>Ficia faba</i>	Fabaceae	Fava bean	Seed pod, stems and leaves.	It is diuretic and expectorant. Used as a tonic.
66	<i>Trifolium repens</i>	Fabaceae	White clover	Leaves, flowers.	Used to purify and cleanse the blood.
67	<i>Bauhinia variegata</i>	Fabaceae	Orchid tree	Leaves, flowers, fruits, seed	It is anti-helminthic, astringent. Used to treat diarrhea, dysentery, piles and hemorrhoids.
68	<i>Medicago sativa</i>	Fabaceae	Alfalfa	leaves	It is used as silage, cover crop, hay, for grazing and as manure.
69	<i>Dalbergia sisso</i>	Fabaceae	North Indian rosewood , Shisham	Wood, tree twigs	Used as a fuel wood, for shade and shelter. The tree twigs can be used as toothbrush and split to make a tongue cleaner.
70	<i>Flemingia fruticulosa</i>	Fabaceae	Wild Hops	Leaves, flowers, roots.	It is antioxidant, anticonvulsant, immune-regulatory, analgesic, antimicrobial, antiulcerogenic, anthelmintic, anti-inflammatory,

					anticancer, estrogenic, cholesterol lowering properties. Used to treat cataract, ulcer, dysentery, epilepsy, helminthiasis, insomnia, stomachache, rheumatism, and tuberculosis.
71	<i>Quercus oblongata</i>	Fagaceae (Oak Family)	Banjh oak	Wood	Its wood is used as fuel and in preparing houses.
72	<i>Geranium ocellatum</i>	Geraniaceae (Geranium Family)	Cranes bills	Root	It is diuretic and astringent. Plant juice is used for amoebic dysentery.
73	<i>Colebrookea oppositifolia</i>	Lamiaceae (Mint Family)	Binda	Leaves, roots, bark	It is antiseptic and antihelmintic. Its leaves are used for cough, fever and dysentery. The root is used for epilepsy.
74	<i>Ajuga bracteosa</i>	Lamiaceae	Neel kanthi	Fresh leaves	The juice from the leaves is used to kill lice in the hair.
75	<i>Salvia plebeia</i>	Lamiaceae	Sage weed	Whole plant Extract	It is diuretic, astringent, and vermifuge.
76	<i>Mentha canadensis</i>	Lamiaceae	American wild mint	Leaves	Used to cure toothache and hiccups.
77	<i>Mentha x piperita</i>	Lamiaceae	peppermint	Leaves	Used to treat diarrhea, indigestion, fever, cough and dysmenorrhea.
78	<i>Vitex negundo</i>	Lamiaceae	Bana	Leaves and seeds.	Hot water extract from its seeds are used in case of fractured bones. Extract from its leaves and seeds are used to bath new born babies and mothers. Leaf smoke acts as mosquito repellent.
79	<i>Clinopodium vulgare</i>	Lamiaceae	Wild basil	Leaves	It is astringent, expectorant and cardiac stimulant. Used to reduce flatulence and to increase perspiration.
80	<i>Pogostemon benghalensis</i>	Lamiaceae	Bengal Pogostemon	Whole plant, root, leaves, shoots, stem, bark.	It is anti-rheumatic, antifungal, antibacterial and antitubercular.
81	<i>Thymus vulgaris</i>	Lamiaceae	Thyme	Whole plant	Used to reduce blood pressure and treat breast cancer cells.
82	<i>Tectona grandis</i>	Lamiaceae	Teak, Sagun	Wood	Its wood is used to prepare outdoor furniture and boat decks.
83	<i>Reinwardtia indica</i>	Linaceae (Flax Family)	Basanti	Flowers, leaves	Its leaves can be chewed to clean the tongue. The decoction of leaves is used for gargling purpose.
84	<i>Linum usitatissimum</i>	Linaceae	Alsi	Seeds	Used to treat constipation and blood sugar.
85	<i>Woodfordia fruticosa</i>	Lythraceae (Loosestrife Family)	Red Bell Bush, Dhawai	Flower, seed, leaves	Used to treat dysentery, diarrhea and burning sensation of skin.
86	<i>Sida rhombifolia</i>	Malvaceae (Mallow/Cotton Family)	Rhombus leaved sida.	Whole plant	Used to treat swelling, headache, diarrhea, rheumatism and asthma.
87	<i>Majus pumilus</i>	Mazaceae (Mazus Family)	Japanese mazus	Leaves, seed	It is emmenagogue, aperients and tonic. Used to treat typhoid.
88	<i>Tinospora cordifolia</i>	Menispermaceae (Moonseed Family)	Giloy	Whole plant (leaf, stem)	Used to treat diabetes, hepatitis (hay fever), high cholesterol and as immune system booster.

89	<i>Morus alba</i>	Moraceae (Mulberry Family)	White mulberry	Leaf extract, root bark	In Asian countries, the root bark is used in traditional medicines. Leaf extracts are known to restore the vascular reactivity of diabetic rats.
90	<i>Myrsine africana</i>	Myrsinaceae (Myrsine Family)	Cape myrtle, African boxwood	Wood, fruit seed, leaves (Whole plant)	Used to treat dysmenorrhoea, headaches and cough and as a blood purifier.
91	<i>Jasminum officinale</i>	Oleaceae (Olive Family)	Chameli	Whole plant leaves, flowers.	It is anti-microbial, anti-ulcerogenic and anti-bacterial.
92	<i>Oenothera rosea</i>	Onagraceae (Evening Primrose Family)	Evening primrose	Entire plant, roots, leaves, flowers, seeds.	Used to treat inflammation, ulcers, diabetes and liver disorders.
93	<i>Oxalis corniculata</i>	Oxalidaceae (Wood Sorrel Family)	Maroli	Fresh leaves	A juice from fresh leaves along with black pepper can be given orally for piles.
94	<i>Oxalis latifolia</i>	Oxalidaceae	Garden pink sorrel	Fresh leaves	Used to treat fever, urinary tract infections, influenza, pimples, snake bites and muscular swelling.
95	<i>Corydalis bulbosa</i>	Papaveraceae (Poppy Family)	Nakai	Plant extract	Used to treat headaches and gastric ulcers. Its extract stimulates blood circulation, decreases pain heals boils.
96	<i>Veronica persica</i>	Plantaginaceae (Plantain Family)	Persian speedwell	Leaves, stem	It is astringent, anti-inflammatory and expectorant.
97	<i>Plantago lanceolata</i>	Plumbaginaceae (Leadwort Family)	Ribwort plantain [3]	Leaves	Used to treat cough, respiratory tract problems, insect bites and skin infections.
98	<i>Plumbago zeylanica</i>	Plumbaginaceae	Chitrak	Root and bark of root	Used to treat tumors, skin diseases, ulcers and leprosy.
99	<i>Rumex hastatus</i>	Polygonaceae (Knotweed or Buckwheat Family)	Yellow sock	Leaf and root	Its leaf extract is used to cure wounds and to stop bleeding.
100	<i>Rumex crispus</i>	Polygonaceae	Curled dock	Leaf, root and fruit.	Used to treat skin inflammations and skin diseases.
101	<i>Persicaria capitata</i>	Polygonaceae	Pinkhead smartweed	Whole plant	Used to treat urologic disorders. Its aqueous extract has anti-oxidative, diuretic and anti-inflammatory properties.
102	<i>Persicaria maculosa</i>	Polygonaceae	Lady' thumb	Leaves and fruits	It is antihelminthic, anti-inflammatory, astringent and diuretic. Used to treat cold, headache and hemorrhoids.
103	<i>Polygonum aviculare</i>	Polygonaceae	Knotweed, knotgrass	Whole plant	The plant is cooked and eaten as food during famines.
104	<i>Polygonum douglasii</i>	Polygonaceae	Douglas's knotweed	Whole plant	It is diuretic, astringent, laxative, emetic and emmenagogue. Used to treat diabetes, arthritis and diarrhea.
105	<i>Anagallis arvensis</i>	Primulaceae (Primrose Family)	Blue scarlet pimpernel	Leaves	External application is suggested to heal ulcers and wounds.

106	<i>Clematis sp.</i>	Ranunculaceae (Buttercup Family)	Murhar	Leaves	Used to treat gout, headaches, fluid retention, syphilis, joint pain, varicose veins, skin conditions and bone disorders.
107	<i>Ranunculus japonicus</i>	Ranunculaceae	Tall buttercup	Whole plant, leaves, roots flower, fruits, seed.	It is anti-periodic, anti-tumor and decongestant.
108	<i>Ranunculus sceleratus</i>	Ranunculaceae	Cursed buttercup	Whole plant, leaves, roots seed.	Used to treat leucoderma, wounds and scabies.
109	<i>Rubus ellipticus</i>	Rosaceae (Rose Family)	Yellow Himalayan Raspberry	Root, leaf buds, Fruits, shoots, bark	It is astringent and febrifuge.
110	<i>Duchesnea indica</i>	Rosaceae	Mock strawberry,	leaves	Leaves are used in case of eczema.
111	<i>Potentilla sunaica</i>	Rosaceae	Cinquefoils	Root, stem, leaf	Used to treat itchiness, abscesses and in case of snakebites.
112	<i>Rubia cordifolia</i>	Rubiaceae (Madder Family)	Indian madder	Roots	Used to treat jaundice, snakebites, scorpion stings, ulcers and as a blood purifier.
113	<i>Galium aparine</i>	Rubiaceae	Cleavers	Whole plant	It is diuretic. Used as lymphatic tonic. Removes urinary stones and lowers blood pressure.
114	<i>Murraya keonigii</i>	Rutaceae (Citrus Family)	Kaddipatta, Sweet neem	Leaves, stem	Its leave finds use in Ayurvedic and Siddha system of medicine. It is often used while making kadhi, thoran, rasam and vada.
115	<i>Aegle marmelos</i>	Rutaceae	Bael, bili or bhel	Fruits	Its raw fruits can be eaten or can be used to prepare candy toffee, nectar, pulp powder etc. Ripe fruit is used to prepare sarbat. Young leaves and shoots are eaten as salad.
116	<i>Salix sp.</i>	Salicaceae (Willow Family)	Willows	Bark, leaves.	It is antibacterial, cardiotonic, anti-inflammatory and anti-hypersensitive.
117	<i>Dodonaea viscosa</i>	Sapindaceae (Soapberry Family)	Hopbrush	Leaf, seed, wood, stem	Used to treat sore throats, cold and rheumatism.
118	<i>Verbascum thapsus</i>	Scrophulariaceae	Grate Mullien	Leaves, flower, seed	It is astringent and emollient. Used to treat skin problems.
119	<i>Buddleja asiatica</i>	Scrophulariaceae (Snapdragon Family)	Neemda	Roots, leaves	Used to treat skin diseases, inflammation, rheumatism and malaria.
120	<i>Solanum nigrum</i>	Solanaceae (Nightshade Family)	Black night shade	Flowers, berries	Used to treat skin diseases, gout and rhenumatism and in case of enlarged liver.
121	<i>Trapaolum majus</i>	Trapeolaceae (Nasturtium Family)	Garden naustrutiu m	Whole plant	It is used as disinfectant. Its leaves have antifungal, antibacterial and diuretic properties. Used to treat minor injuries and skin eruptions.

122	<i>Urtica dioica</i>	Urticaceae (Nettle Family)	Bichchhu buti	Seeds, leaf, roots	Used to treat skin ailments, influenza, hemorrhage and rheumatism.
123	<i>Lantana camara</i>	Verbenaceae (Verbena Family)	Phulanu	Leaves, roots and flowers.	It has anti-microbial, insecticide and fungicide properties.
124	<i>Duranta erecta</i>	Verbenaceae	Golden dewdrop	Entire plant	It has antioxidant, insecticide and antimicrobial properties.
125	<i>Verbena sp.</i>	Verbenaceae	Vervain	Whole plant	Used as herbal tonic to stop muscle spasms, to reduce fever, as a sedative, to improve digestion and as an appetizer.
