

NMHS Progress Report

(Period from March, 2019 to March, 2020)

1. Project Information:

Project ID:	NMHS-2017/LG/01/475	Sanction Date:	22/12/17
--------------------	---------------------	-----------------------	----------

Project Title:	Invasive Alien Plants in Himalayas: Status, Ecological Impact and Management
BTG:	

PI and Affiliation (Institution):	Prof. Vinod Kumar Garg Central University of Punjab, Bathinda
Name & Address of the Co-PI, if any:	<p>1) Jammu & Kashmir</p> <ul style="list-style-type: none"> • Prof. Zafar A Reshi Department of Botany, University of Kashmir • Prof. Namrata Sharma Botany Department, University of Jammu • Dr. Manzoor A Shah Botany Department, University of Kashmir • Dr. Aijaz Hassan Ganie Department of Botany, University of Kashmir-Kargil Campus <p>2) Himachal Pradesh</p> <ul style="list-style-type: none"> • Prof. Daizy R. Batish Botany Department, Panjab University, Chandigarh • Dr. Shalinder Kaur Botany Department, Panjab University, Chandigarh • Dr. Surender Yadav Botany Department, MDU, Rohtak <p>3) Uttarakhand</p> <ul style="list-style-type: none"> • Prof. Harminder Pal Singh Department of Environment Studies, Panjab University, Chandigarh • Dr. Kuldip Dogra BSI, Dehradun <p>4) Sikkim & West Bengal</p> <ul style="list-style-type: none"> • Dr. L. B. Chaudhary, Senior Principal Scientist Plant Diversity, Systematics and Herbarium Division CSIR- National Botanical Research Institute, Lucknow - 226 001. • Dr. Soumit K. Behera, Senior Scientist Plant Ecology and Climate Change Science Division CSIR- National Botanical Research Institute, Lucknow - 226 001. <p>5) Mizoram & Tripura</p> <ul style="list-style-type: none"> • Dr. S.S. Dash, Scientist-E and Project Partner Botanical Survey of India, 3rd MSO building, sector-1, salt lake city, Kolkata-700064 <p>6) Manipur, Nagaland & Arunachal Pradesh</p> <ul style="list-style-type: none"> • Dr. L.B. Singha • Prof. H.S. Yadav

Structured Abstract - detailing the current year progress [Word Limit 250 words]:

1) Jammu & Kashmir:

Field surveys were carried out in Kashmir, Jammu, and Ladakh for collection, identification and inventorization of alien plant species.

During the period under review 1086 plant species were collected from the study area that belong to 674 genera and 71 families. Of these, 66 families are of angiosperms (55 dicot and 11 monocot families) 2 of gymnosperms and 3 are pteridophytes. Amongst angiosperms, 896 species are dicots and 177 species are monocot; 7 species belong to gymnosperms and 6 to pteridophytes. The first 5 largest families include: Asteraceae (215 species), Poaceae (116 species), Leguminaceae (95 species), Ranunculaceae (84 species), Brassicaceae (78 species) and Rosaceae (56 species). In terms of growth habit, 920 species are herbs, 115 are shrubs/sub-shrubs and 38 are trees. Among these 1086 species 850 are native and 236 are alien.

807 plant species were collected from different habitats of Ladakh. These plant species belong to 324 genera in 71 families. Of these 66 families belong to angiosperms (55 dicot and 11 monocot families), 3 to pteridophytes and 2 to gymnosperms. Amongst angiosperms, 646 species are dicots and 148 species are monocot; 7 species belong to gymnosperms and 6 species to pteridophytes. The first 5 largest families include: Asteraceae (105 species), Poaceae (95 species), Leguminaceae (49 species), Brassicaceae (43 species), Rosaceae (42 species) and Ranunculaceae (39 species). Of the 807 plant species recorded 718 species are native and 89 are alien. Amongst the alien species 49 species are invasive, 21 species are casual and 19 species are naturalized.

268 plant species were collected from Kashmir till date. These plant species belong to 176 genera in 57 families. Of these 57 families 45 are dicots, 9 families are monocots and one each of gymnosperms and pteridophytes. Amongst the recorded species, 217 species are dicots and 49 species are monocot, 3 gymnosperms and 1 species to pteridophytes. The first 5 largest families include: Asteraceae (39 species), Poaceae (33 species), Rosaceae (15 species), Polygonaceae (14 species) and Brassicaceae (13 species). It has been observed in the present study that 239 species are herbs, 19 shrubs, and 7 trees. Majority of the plant species are perennial (149 species) followed by annuals (104 species) and biannuals (17 species).

From Jammu region, 262 species were collected (Annexure II) and identified after undertaking field surveys in study sites. These species belonged to 189 genera and 73 families. Dicots were predominant with 232 species spread over 168 genera and 67 families. Monocots were represented by 29 species belonging to 20 genera and 5 species. One gymnosperm was recorded during the present survey. The first four largest families were Asteraceae (30 species), Fabaceae (21 species), Poaceae (17 species), and Lamaceae (12 species). The study revealed

that 111 species are herbs, 25 shrubs, 47 trees and 7 climbers.

All the alien plantspecies collected from the three regions are listed in Annexure III. These species belong to 128 genera and 43 families; of the 37 families belong to dicotyledons and 6 to monocotyledons. Among dicotyledons, Asteraceae included the largest family number with 47 specie, followed by Amaranthaceae with 14 and Brassiceae with 12; among monocots Poaceae was the largest family with 34 species followed by Cyperaceae with 7 and Irridiaceae with 6 species. Amongstthe alienalien plant species majority of the species (109 species) were invasive followed by naturalized (70species) and casual (57 species) alien plant species.

From Ladakh region, 89 alien plant species were collected (Annexure IV) and identified after undertaking field surveys in study sites. These species belonged to 57 genera and 25 families. The first four largest families were Asteraceae (16 species), Poaceae (14 species), Amaranthaceae (10 species), and Rubiaceae (6 species). The study revealed that 81 species are herbs, 5 shrubs and 3 trees.

From the Kashmir region, 175 alien plant specieswere collected during the present study (Annexure V). These species belonged to 115 genera in 45 families (37 families were of dicotyledons, 6 of monocotyledons, 1 of gymnosperms, and 1 of pteridophytes). Asteraceae was the largest family with 23 species followed by Fabaceae and Polygonaceae with 11 species each and in monocots Poaceae was the largest family with 21 species. Most of the species collected were annual herbs. Majority of the species are naturalized; among the naturalized taxa, 50 species are alien invasive, 49 naturalized in wild and 5 species are casual aliens.

From Jammu region, 65 plant species are alien (Annexure VI) which belongs to 57 genera and 28 families (Table 23). Dicots were predominant with 57 species spread in 25 families. Monocots were represented by 10 species belonging to 6 genera and 3 Famalies (Table 24). The largest families were Asteraceae followed by Apocyanaceae. The study revealed that 50 species are herbs, 11 shrubs, 4 are trees. Majority of the alien plant species are perennial (49 species) followed by annuals (16species).

2)Himachal Pradesh:

With the initiation of the project, two Junior Research Fellows (JRFs) and one Field Assistant was recruited. Field trips were undertaken in different habitats in different districts (Shimla, Chamba, Una, Sirmour, and Solan) and data collected was analyzed for non-native species. Specimens of plants were collected and dried to prepare herbarium sheets. Soil samples were also collected. These non-native species were further analyzed for their ecological impact through IVI. GPS coordinates and plant photographs were collected. Soil samples were stored and submitted for analysis of soil properties (under process).

3)Uttarakhand:

Surveys were carried out in various parts of the study area such as Almora, Haridwar, Nanital, Dehradun and Pauri-Gharwal of Uttarakhand. Plant species were collected and date was analyzed for nativity. During the visits, extensive photographs and GPS coordinates of sites were taken. We have recorded invasive alien species in study sites so far. Soil samples and specimens of plants were collected and dried to prepare herbarium sheets. Analysis of vegetation and physio-chemical analysis of soil samples is in process. By calculating IVI, ecological impact was assessed.

4)Sikkim & West Bengal:

One tour were conducted in 2019 in to different regions of South, West and North Sikkim while in the year of 2020 no any tour was conducted. Phytosociological analysis of invasive alien plant species (IAPS) and its associates were done by random quadrat sampling were laid between 300 m – 2700 m altitudes, however, the survey was conducted up to 5000 m altitudes in North Sikkim. Few plots were also conducted in Darjeeling Himalaya. In Sikkim Himalaya: *Ageratina adenophora* was observed in all altitudinal gradients (300 m- 2700 m) with highest number of individuals. *Chromolaena odorata* was observed almost in all gradients but with lesser number of individuals. *Lantana camara* was observed in all gradients with scanty distribution with lowest density. *Mikania micrantha* was distributed in lower altitudes >600 m – 1200 m with high density. These species were majorly found near human habitants, along road side and shady areas where moisture was available (near waterfall). During the field study, forth targeted species that is *Ageratina riparia* was not observed.

While in Darjeeling Himalaya: Very few no. of plots was laid in between 1500m to 2100m altitudinal gradient. There were *Ageratina adenophora* noticed with highest values followed by other associates. There were no other targeted species found during field survey.

In Sikkim area, study reveals that extraordinary rapidity of some of the species like *Ageratina adenophora*, *Ageratum conyzoides*, *Bidens pilosa*, and *Tridax procumbens* are causing alarming threat along with targeted species.

5)Mizoram & Tripura:

After one year progress of the project, almost 30% work was performed through multiple field tours during 2018-2019. As With the initiation of the project, all the research personnel were recruited through a common screening test appointed in due course. All the project personnel were briefed about the objectives of the project. Literature survey was made thoroughly about the study area and all the base line information about invasive species, ecological parameters, study sites were gathered through secondary data. All the research personnel were taken to the field and given training on the basics of invasive plants, laying quadrates, collection of data. Based on elevation data and GIS, the study sites were selected and elevation maps of 1x1 sq.km. Grid maps were prepared. As a continuation of the work during 2018-2019, three more field tours were conducted in Mizoram during 2019-2020 w.e.f. 23-04-2019 to 10-05-2019 ; 09-09-2019 to 27-09-2020 and 24-02-2020 to 10-03-2020 in different seasons to collect floristic and ecological data from the selected study areas. Different protected areas of Mizoram i.e. Phawngpui National park, Murlen National park, Lengteng Wildlife Sanctuary and non-protected areas like Sangau, Tahtlang, South Vanlaiphai, West Vanlaiphai, Knahlan were visited for field works during 2019-2020. Nearly 700 more herbarium sheets were collected to ascertain added number of alien invasive

load reported than last year. During this period, extensive photographs of the invasive plants were taken (please refer to **photographic plates, annexure-1**) and GPS data were recorded using **Garmin Montana 680** device to keep track of the quadrat sampling points. Quantitative analysis of the invasive plants particularly of *Mikania micrantha* and *Ageratina adenophora* were done. Associated invasive alien plants like *Ageratum conyzoides*, *Lantana camara*, *Chromolaena odorata* and *Parthenium hysterophorus* were also reported with their Importance Value Index. Plant specimens of the invasive plants were collected and dried and preserved properly for preparing herbarium sheets. An added number of 30 alien species during 2019-2020.

As a part of the project objective, it is essential to interact with the local stakeholders like university students, NGOs, forest department officials and local farmers who can directly or passively take part in evaluating the ecological investigation of the targeted invasive plants. Awareness programmes are the most effective way to interact with the local stakeholders. Keeping in mind the importance of awareness programmes, “**A one day Awareness Programme cum Workshop on Invasive Alien Plants in Himalayas: Status, Ecological Impact and its Management**” was conducted in **26th April, 2019** at **Mizoram University Campus** with an targeted audience of more than 60 participants from different areas of Mizoram.

Rabishankar Sengupta, a junior Project fellow of this project, presented two posters in two important International Conferences under the supervision of Dr.S.S.Dash, Scientist-E & Project Partner. Rabishankar Sengupta attended & presented a poster on the topic “A comparative taxonomic account of three invasive alien species of Eupatorium in Mizoram” in International Conference on “Algae, Fungi & Plants: Systematics to Applications” on 24-25th January, 2020 at Kolkata. He also presented a poster on the topic “A comprehensive inventory of invasive alien plants in Tripura” in BSI International symposium on Plant Taxonomy and Ethno botany 2020 at Kolkata.

One research paper regarding the inventory & ecological status of top 10 obnoxious invasive alien plants in Mizoram is also communicated in a peer reviewed international journal on 21st March, 2020.

6) Manipur, Nagaland & Arunachal Pradesh:

During the period, several localities of Arunachal Pradesh and Manipur were surveyed considering elevation ranges. An additional 14 new IAVPS were recorded during this period, accounting to cumulative of 73 species till date to the last year's 59 recorded species. The new additions include highly invasive species like, *Ageratina riparia*, *Asclepias curassavica*, *Alternanthera philoxeroides* in Manipur and *Lippia alba* from Arunachal Pradesh. The following noxious IAVPS viz *Ageratina adenophora*, *Ageratum conyzoides*, *Ageratum houstonianum*, *Bidens pilosa*, *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Parthenium hysterophorus*, *Tithonia diversifolia*, *Galinsoga quadriradiata*, *Artemisia nilagirica* were identified and recorded. New sets of DEMs according to 300m elevation gradient were prepared for each of the three states. GPS locations of all the species recorded were extrapolated on the DEM maps. All of the above-mentioned species were recorded except *P. hysterophorus* and *G. quadriradiata* at various localities during the field investigation. *P. hysterophorus* was absent in the hill and inside forest areas while it was observed growing in dense populations near human habitations. The presence of IAVPS was found to be almost absent in elevations more than 1500m asl in Arunachal Pradesh, where only less populations of *Ageratum spp.* and *A. adenophora* were observed. The population of *Mikania micrantha*, *A. conyzoides*, *A. houstonianum* and *Bidens pilosa* at higher elevations was also found to be comparatively less than lower elevation plots.

For the phytochemical analysis, chlorophyll contents of the selected IAVPS were extracted and estimated with photometric analysis. Analysis of soil parameters of

	<p>different soils collected from different localities was done and soil data for the invaded sites with respect to various IAVPS were generated. As part of livelihood options, vermicomposting experiments were conducted utilizing the shoot parts of five IAVPS and their nutrient contents were analysed. The total phosphorus content and the total potassium content increased two-fold with that of raw dung indicating that all the composts harvested have high nutrient values. The experimental data suggest that selected invasive species are potential sources for the utilization of organic compost. Germination tests were conducted for four species. <i>A. conyzoides</i>, <i>A. houstonianum</i>, and <i>M. micrantha</i> showed a highly successful rate of germination while <i>L. camara</i> all of the seeds failed to germinate.</p>
--	--

Project Partner Name	Affiliations	Role & Responsibilities
Project partner for Jammu & Kashmir	<p>Prof. Zafar A Reshi Botany Department, University of Kashmir</p> <p>Prof. Namrata Sharma Botany Department, University of Jammu</p> <p>Dr. Manzoor A Shah Botany Department, University of Kashmir</p>	<p>Invasion load of alien plants in the Jammu, Kashmir, Ladakh and adjoining areas of Himachal Pradesh. Documentation of alien vascular plant species across different natural and artificial ecosystems in the three distinct regions of J&K State, and adjoining areas of Himachal Pradesh and identification of ecosystems most vulnerable to alien plant invasions. Categorization of alien plant species particularly on the basis of their stage of invasion in order to identify current and future invaders. Biology of worst invasive species to identify the traits that promotes their invasiveness. Species distribution modeling for prediction of potential range expansion of alien species in response to present and predicted climate change scenarios. Development of effective policies and appropriate strategies for conservation and management of alien plant invasions through community participation.</p>

	<p>Dr. Aijaz Hassan Ganie</p> <p>Botany Department,</p> <p>University of Kashmir,</p> <p>Kargil Campus</p>	
Project partner for Himachal Pradesh	<p>Prof. Daizy R. Batish Botany Department, Panjab University, Chandigarh</p> <p>Dr. Shalinder Kaur Botany Department, Panjab University, Chandigarh</p> <p>Dr. Surender Yadav Botany Department, MDU, Rohtak</p>	To carry out ecological investigation in the state of Himachal Pradesh & to assist in the project work in terms of organizing field trips and preparing the project reports
Project partner for Uttarakhand	<p>Prof. Harminder Pal Singh Department Environment Studies, Panjab University, Chandigarh</p> <p>Dr. Kuldip Dogra BSI, Dehradun</p>	To carry out ecological investigation in the district of Kinnaur, Himachal Pradesh and Uttarakhand.
Project partner for Sikkim & West Bengal (Darjeeling)	<p>Dr. L. B. Chaudhary</p> <p>CSIR- National Botanical Research Institute, Lucknow</p>	PI (CSIR-NBRI), Sikkim and Darjeeling Himalayas.
Project partner for Mizoram & Tripura	<p>Dr.S.S.Dash, Scientist-E ,</p> <p>Botanical Survey of India,3rd MSO building, Sector-1, Salt lake City, Kolkata-700064</p>	To carry out ecological investigation in the state of Tripura and Mizoram.
Project partner for Manipur, Nagaland &	<p>Dr. L.B. Singha</p> <p>Department of Forestry,</p>	Implementation of the project in Arunachal Pradesh, Nagaland and Manipur states of Eastern Himalayas to fulfill the project objects with

<p>Arunachal Pradesh</p>	<p>North Eastern Regional Institute of Science & Technology (NERIST), Nirjuli, Arunachal Pradesh</p> <p>Prof. H.S. Yadav</p> <p>Department of Forestry,</p> <p>North Eastern Regional Institute of Science & Technology (NERIST), Nirjuli, Arunachal Pradesh</p>	<p>special reference to <i>Chromolaena odorata</i>, <i>Ageratina adenophora</i>, <i>Mikania micrantha</i>, <i>Galinsoga ciliata</i> and other noxious IAP species. The team will look after the survey and identification for Invasive Alien Plant Species, occurring in the proposed three states as well as the analysis of features of the habitats of the IAS, detail sampling, population, phytosociological studies and seed biology for the IAPS. The GPS tagging and geo-referencing of selective IAPS, development of Layer map for IAPS (distribution/density) and analysis of rate of invasion of IAPS using RS/GPS/GIS will be worked out. Impact assessment of IAS on native plants/crops, in terms of regeneration behavior and phytochemical parameters.</p>
---------------------------------	--	---

2. Project Site Details

Project Site	INDIAN EASTERN HIMALAYAS
IHR States Covered	<p>Jammu & Kashmir: Jammu, Kashmir, Ladakh and adjoining areas of Himachal Pradesh.</p> <p>Himachal Pradesh: District Solan, Sirmaur, Una, Bilaspur, Hamirpur, Chamba, Kullu, Shimla, Kangra, Mandi.</p> <p>Himachal Pradesh and Uttarakhand: District Kinnaur, Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, Pauri Garhwal, Pithoragarh, Rudrapur, Teri Garhwal, Udham Singh Nagar, Uttarkashi.</p> <p>Sikkim and West Bengal: Sikkim & Darjeeling himalayas</p> <p>Mizoram & Tripura:- Phawngpui NP, Murlen NP, Lengteng WLS, Pualreng WLS, Some Non-protected areas namely Sangau, Vanghmun, Murlen village, Knahlan (Mizoram); Sepahijola WLS (Clouded leopard NP), Trishna WLS (Bison NP), Rowa WLS, Gomati WLS, Some Non-protected areas namely Karbook, Gomati district, Jatanbari, Panisagar. (Tripura)</p> <p>Arunachal Pradesh, Nagaland, Manipur</p>
Long. & Lat.	Attached as Annexure-III

Site Maps	Attached as Annexure- III (Along with GIS maps)
Site Photographs	Attached as Annexure- IV

3. Project Activities Chart w.r.t. Timeframe [Gantt or PERT]

PROJECT ACTIVITIES	WORK UNDERTAKEN				OUTPUT
	Year(2019-2020)				
	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
Survey and documentation of IAS	✓		✓	✓	Field tours were conducted and additional IAPS were reported.
Morphological characterization and identification				✓	Morphological characterization of the targeted species and identification were performed.
Phytosociological analysis along altitude	✓			✓	Phytosociological analysis of the targeted invasive alien plants were performed along altitudinal gradient in different study sites.
Analysis of data			✓	✓	IVI, Frequency, Density, A bundance and Importance value of the targeted species in different study site was calculated.

Preparation of Annual Report				✓	Preparation of Annual report was done including all the aforementioned data.
Project Review Meeting					Cancelled due to COVID-19 advisory by Government of India

4. Financial and Resource Information

Note: A separate bank account is expected to be opened for NMHS Project as per the provision of Direct Beneficiary Account (DBA) as laid out by the Govt. of India and also facilitate the audit of accounts. The interest earned out of the NMHS project funds should be reported clearly in the utilization certificate.

Name of the Partner	Total Grant:	Grant Received Date
Prof. Zafar A Reshi	63,17000/-	05 May 2018
Prof. Daizy R. Batish	7,417,000/-	23th May 2017
Prof. Harminder Pal Singh	7,417,000/-	23th May 2018
Dr. L. B. Chaudhary,	51,67000 /-	
Dr. S.S.Dash	51,67000/-	7th May 2018
Dr. L.B. Singha	64,17,000/-	07 th May 2018

Project Partner(s)	Affiliations/ Institution	Budget Allocated to	Work Done
Partner 1	University of Kashmir	Prof. Zafar A Reshi	Please see the project information time to time.
Partner 2	Panjab University, Chandigarh 160014	Prof. Daizy R. Batish	Please see the project information time to time.
Partner 3	Panjab University, Chandigarh 160014	Prof. Harminder Pal Singh	Please see the project information time to time.
Partner 4	CSIR- National Botanical Research Institute, Lucknow	Dr. L. B. Chaudhary,	Please see the project information time to time.
Partner 5	Botanical Survey of India, 3rd MSO building, Sector-1, Salt lake City, Kolkata-700064	Dr. S.S.Dash ,Scientist-E	Please see the project information time to time.
Partner 6	North Eastern Regional Institute of	Dr. L.B. Singha	Please see the project

	Science & Technology (Deemed to be University), Nirjuli, Arunachal Pradesh		information time to time.
--	--	--	---------------------------

Project Staff Information:



Sl.No.	Name	Qualification	Designation	Fellowship/ Wages paid	Remarks
Project Partner: Prof. Zafar A Reshi					
1.	Mr. Shabir Ahmad	Msc botany NET,GATE	JPF	25,000 /-	Joined on 23/07/2018
Project Partner : Prof. Daizy R. Batish					
2.	Sonia Rathee	MSc Botany	JRF	25,000 /-	Joined on 27/07/2018
3.	Mustaqeem Ahmad	MSc Botany	JPF	16,000/-	Joined on 27/07/2018
4.	Ram Narayan	12 th Standard	Field Assistant	10,000 /-	Joined on 27/08/2018
Project Partner : Prof. Harminder Pal Singh					
5.	Padma Sharma	MSc Environment Studies	JRF	25,000 /-	Joined on 27/07/2018
6.	Astha Sharma	MSc Environment Studies	JRF	25,000/-	Joined on 27/07/2018
7.	Gurpreet	12 th Standard	Field Assistant	10,000 /-	Joined on 27/07/2018
Project Partner : Dr. L. B. Chaudhary					
8.	Mr. Anil K. Verma	M.Sc. Botany, GATE	Project-JRF	Rs 25,000/-	Joined on 25/06/2018
9.	Miss Rashmi Nayak	M.Sc. Botany	Project Assistant-II	Rs 16,000/-	Joined on 25/06/2018
Project Partner:Dr.S.S.Dash					
10.	RABISHANKAR SENGUPTA	MSc Botany	JPF	16,000 /- + 20% HRA	Joined on 16/07/2018 & continuing.
11.	YOGESH PRABHAKAR KHILARI	MSc Botany	JPF	16,000 /- + 20% HRA	Joined on 29/08/2018 & Discontinued on 05/08/2019.
12.	BISWAJIT BANIK	BA English	Field Assistant	10,000 /-	Joined on

01/08/2018

Project Partner: Dr. L.B. Singha

13.	Mr. M. Sanjoy Singh	M.Sc. Pass	Junior Research Fellow	25,000+ 10% HRA	
14.	Mr. Dencil Basumatary	M.Sc. Pass	Junior Project Fellow	16,000/-	..
15.	Mr. Bijit Basumatary	12 th standard pass	Field Assistant	10,000/-

5. Equipment and Asset Information**1) Prof. Zafar A Reshi**

S. No.	Equipment Name (Qty)	Details (Make/ Model)	Cost	Date of Installation	Photographs of Equipment	Lowest Quotation, if not purchased.
1.	Equipment 2	Handheld GPS Mobile Mapper 50	2,94,882	Janury - 2019		
2.	Equipment	Thermo-scientific oven (400 ltr) Model OG5400	440,764	March-2019		

2) Prof. Daizy R. Batish:-

S. No.	Equipment Name (Qty)	Details (Make/ Model)	Cost	Date of Installation	Photographs of Equipment	Lowest Quotation, IF NOT purchased
1.	Equipment 1	GPS (Trimble TDC-100)	In progress			

3) Prof. Harminder Pal Singh


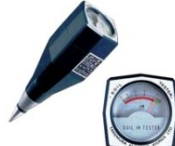

S. No.	Equipment Name (Qty)	Details (Make/ Model)	Cost	Date of Installation	Photographs of Equipment	Lowest Quotation, IF NOT purchased
1.	Equipment	GPS purchase in				

1	process				
---	---------	--	--	--	--

4) Dr. L. B. Chaudhary:-

S. No.	Equipment Name (Qty)	Details (Make/ Model)	Cost	Date of Installation	Photographs of Equipment	Lowest Quotation, IF NOT purchased
1.	Equipment 1 GPS	Purchased	1,53,000/-	April 2019		

5)Dr.S.S.Dash :-

S. No.	Equipment Name (Qty)	Details (Make/ Model)	Cost	Date of Installation	Photographs of Equipment	Lowest Quotation, IF NOT purchased
1.	Equipment 1	GPS (Garmin Montana 680)	53,200/-			
2.	Equipment 2	Imaging device (Two)	64,500/-			
3.	Equipment 3	Takemura Soil pH & Moisture meter	8,909/-			
4.	Equipment 4	Mitutoyo Slide Caliper 150 mm	11,505/-			
5.	Equipment 5	Camera	28000/-			

6) Dr. L.B. Singha:-

S. No	Equipment Name (Qty)	Details (Make/ Model)	Maker	Cost	Purchase date of Equipment	Lowest Quotation, IF NOT purchased
1.	Equipment 1	Fluorescence Spectrometer (1)	BioEra Life Sciences Pvt. Ltd. Model- Quo	.6,14,250/-	14 August 2018	.Equipment 1
2.	Equipment 2	Cooling Centrifuge (1)	BioEra Life Sciences Pvt. Ltd. Model- Cogent	.5,35,500/-	14 August 2018	Equipment 2
3.	Equipment 3	GPS (1)	TRIMBLE TDC 100	.1,53,400/-		.Equipment 3
4.	Equipment 4	SYSTAT 13.2 (1)	SYSTAT Software Inc. USA	.47,250/-		.Software
5.	Equipment 5	SIGMAPLOT 14 (1)	SYSTAT Software Inc. USA	37,800/-		Software

6. Expenditure Statement and Utilization Certificate

Expenditure Information:

. No.	Financial Position/Budget Head	Funds Sanctioned	Expenditure up to 31 st match	Remaining Balance	Extra Expenditure	% of Total cost
1.	Salaries/Manpower cost	43,20,000	31,66,491	11,53,509	4,62,741	73.30
2.	Travel	18,00,000	14,66,577	3,33,423	38309	81.48
3.	Expendables & Consumables (Chemicals and Glasswares)	6,00,000	5,44,020	55,980	NIL	90.67
4.	Contingencies	7,50,000	5,49,105	2,00,895	NIL	73.21
5.	Activities & Other Project cost	18,00,000	5,56,745	12,43,255	NIL	30.93
6.	Institutional Charges	1,20,000	80,000	40,000	NIL	66.67
7.	Other expenditures Software's for ecological analysis etc.	12,00,000	5,34,479	6,65,521	NIL	44.54
8.	Equipments	88,00,000	67,29,606	20,70,394	NIL	76.47
9.	Accrued Bank Interest	4,37,456				
	Total	1,98,27,456	1,36,27,023	57,62,977	5,01,050	71.26

Expenditure Information:

Period	Annual Report	Expenditure Statement
2018-19	Annexure-Ia	Annexure-Ib

7. Project Beneficiary Groups

Beneficiary Groups [Capacity Building]	Target	Achieved
No. of Beneficiaries with income generation:	Seventeen	Recruitment of Twelve JPF and Five Field Assistants .
No. of stakeholders trained, particularly women:	Eight	02 nos. each from Arunachal Pradesh, Nagaland and Manipur states; 02 from Uttarakhand and Himachal Pradesh.
No. of capacity building Workshops/trainings:	Three	1)A one day Awareness Programme cum Workshop on Invasive Alien Plants in Himachal Pradesh .

		Status, Ecological Impact and its Management” was conducted in 26th April, 2019 at Mizoram University Campus with an targeted audience of more than 60 participants from different areas of Mizoram . 2) An awareness programme has been conducted in District Sirmaur and Nahan. 3) Workshop cum training programmes successfully held: Manipur University, Imphal on 19.6.19. NERIST, Arunachal Pradesh on 10.02.20
No. of Awareness & outreach programmes:	Nine.	Seven completed,two in progress.
No. of Research/ Manpower developed:	Seventeen	Recruitment of Twelve JPF and Five Field Assistant.

8. Project Progress Summary (as applicable to the project)

Description	Total (Numeric)	Description
<i>IHR States Covered</i>	11	Jammu and Kashmir, Himachal Pradesh, Uttrakhand, Sikkim, West Bengal(Darjeeling), Mizoram, Arunachal Pradesh, Manipur, Nagaland, Tripura.
<i>Project Site/ Field Stations Developed:</i>	Please refer Annexure-III	<p>Jammu & Kashmir:Jammu, Kashmir, Ladakh and adjoining areas of Himachal Pradesh</p> <p>Himachal Pradesh:District Solan,Sirmaur,Una,Bilaspur, Hamirpur,Chamba,Kullu, Shimla, Kangra, Mandi.</p> <p>Himachal Pradesh and Uttarakhand: District Kinnaur ,Almora, Bageshwar, Chamoli, Champawat, Dehradun, Haridwar, Nainital, PauriGarhwal, Pithoragarh,Rudraprayag, Teri</p>

		<p>Garhwal,Udham Singh Nagar, Uttarkashi.</p> <p>Sikkim and West Bengal: Sikkim & Darjeeling himalayas</p> <p>Mizoram & Tripura:-: Phawngpui NP,Murlen NP,Lengteng WLS,Pualreng WLS, Some Non-protected areas namely Sangau,Vanghmun,Murlen village,Knahlan(Mizoram); Sepahijola WLS(Clouded leopard NP),Trishna WLS (Bison NP), Rowa WLS,Gomati WLS, Some Non-protected areas namely Karbook,Gomati ditrict,Jatanbari,Panisagar. (Tripura)</p> <p>Arunachal Pradesh, Nagaland, Manipur.</p>
<i>No. of Patents filed (Description):</i>	NIL	NIL
<i>Article/Review/Research Paper/ Publication:</i>	Four	Communicated
<i>New Methods/ Modeling Developed (description in 250 words):</i>	NIL	NIL
<i>No. of Trainings/Awareness programmes (No. of Beneficiaries):</i>	Nine	Forest, NGOs and Students, Some villagers are the target audiences
<i>Workshop:</i>	Three	Will be covered under training programme.
<i>Demonstration Models (Site):</i>	Please refer Annexure-III	
<i>Livelihood Options:</i>	NA	
<i>Training Manuals:</i>	Nine	One Brochure, Three pamphlets and Five posters developed.
<i>Processing Units:</i>	NA	NA
<i>Species Collection:</i>	Please refer Annexure-II	
<i>Species identified:</i>	Please refer Annexure-II	
<i>Database/ Images/ GIS Maps:</i>	Please refer Annexure-III	

9. Project Linkages (with nearby Institutions/State Agencies)

S. No.	Institute/ Organization	Type of Linkages	Brief Description
1.	Department of Forest, Government of Mizoram	Official	To provide official permission, to entry in the restricted, protected areas and logistic supports.
2.	Department of Forest, Government of Tripura	Official	To provide official permission, to entry in the restricted, protected areas and logistic supports.
3.	Mizoram University	Official	For undertaking capacity building programme.
4.	State Forest Department of Arunachal Pradesh, Nagaland and Manipur	Official	Joint venture for identifying the forest areas affected from the invading exotic plants and strategy planning to mitigate the failure in natural regeneration by native timber species.
5.	Manipur University, Imphal; Central Agricultural University, Imphal; ICAR, Imphal; IBSD, Imphal; Nagaland University, Lumami; ICAR, Medziphema, Nagaland; Rajiv Gandhi University, Itanagar; Central Agricultural University, Pasighat	Official	Knowledge sharing and Capacity building in respective states of the study

10. Additional (publication, recommendations, etc.)

Time Period	Publications (Research Papers, Information Material, Policy drafts, Patents, etc.)
Annual [Year]	[Attach]

11. Project Concluding Remark

Kindly update the following Progress Parameters for the Reporting Period:

Project Objectives	Project output against each objective	Progress made against monitoring indicators(Specified in sanction letters)	Remarks
Identifying established and new Invasive Alien Vascular Plant Species (IAVPS) in all the 15 Indian Hilly States of Himalaya and estimating the invasion load	New Datasets: Complete inventory, distribution and areas infested by Invasive Alien Species in the Indian Himalayas	✓ Lists of IAVPS from different Himalayan states are documented.	Please refer annexure-II
Characterizing the IAVPS on the basis of their life-forms, lifespan, nativity, status of invasion and purpose of invasion/introduction		✓ The collected plant species from different study areas were assigned a growth form category, such as herb, shrub, and tree. Likewise, each alien plant species was assigned a life span category (i.e. annual, biennial or perennial) based on the field observations;their mode of introduction was also recorder from secondary data sources.	Please refer annexure-II
Preparing protocols for prediction, early detection and risk assessment of IAVPS	Dynamic model: Rate & mode of spread (including vectors responsible) with GPS & ground truthing	✓ GPS co-ordinates were recorded at each study site for individual quadrats.	Please refer annexure-III
Assessment of Ecological & Environmental Impact of invasion and spread with special reference to phytodiversity and soil especially in relation to climate change; This will include	Base line studies & Assessment Reports to state agencies of the disappearance of native plant species (If any).	✓ Assessment of impact of invasion in various protected areas along with abundance, frequency and IVI data.	Please refer annexure-II

the level of disappearance of native species			
Selection of at least 10 most noxious established and 10 Neo-invasives and consolidation of all available information including their biology, itemizing at the same time the knowledge gaps	Value addition and sustainable utilization of bio-resources for livelihood of local communities	<ul style="list-style-type: none"> ✓ A list has been prepared for the 10 most noxious established invasive alien plants; their ecological data have been analysed. Frequency, Abundance, Density, IVI of each plant calculated. 	Please refer annexure-II
Identification of a cross-sectoral group to assess the situation in the form of case-studies on these species, and also to formulate workable management strategies aiming to prediction, prevention and control.	Policy and legislative mechanisms for management / eradication / mitigation will get framed.	<ul style="list-style-type: none"> ✓ Awareness programme and workshops have been conducted at respective states to ensure interaction with the local stakeholders preferably forest officials, students, NGOs and nature enthusiasts. ✓ More awareness programmes are going to be held at each study area in the coming year. 	Please check annexure-IV for photographs
Methodology (in brief):	<ul style="list-style-type: none"> ❖ The methodology involves the survey and collection of IAVPS from Jammu & Kashmir; Himachal Pradesh; Uttarakhand; Sikkim & West Bengal; Mizoram & Tripura; Manipur, Nagaland & Arunachal Pradesh during various seasons from different altitudes. Apart from the collections of specimens, observations were made on the habitat of species, phenology, associate species, life span, temperature, moisture etc. All known localities were surveyed to document IAVPS and know their status of invasion in those areas. Routine herbarium procedures (Jain & Rao, 1976) were followed for preparing voucher herbarium specimens. Identification of species was carried out with the help of Floras, existing regional monographs/ revisions, protologues, renowned journals and other authentic specimens deposited at various herbaria of the country. Phytosociological analysis of IAVPS and its associate species were carried out by quadrat sampling (Mishra, 1968), Mueller-Dombois and Ellenberg (1974) and Magurran (1988) in Jammu & Kashmir; Himachal Pradesh; Uttarakhand; 		

	<p>Sikkim & West Bengal; Mizoram & Tripura; Manipur, Nagaland & Arunachal Pradesh regions during the survey conducted in the year 2018 and (January - March) in 2019. Sampling was done by randomly placing quadrats of 5x5 m² size, and within those 5x5 m² quadrats of 1x1 m² were performed to study the phytosociological data. Severe infested areas with IAVPS were marked & tagged for future survey. Tagging was made in selected sites for the study various phytosociological data in the subsequent visit. Mostly the areas highly infested with IAVPS were studied i.e. protected & non-protected areas, roadsides, fallow lands, agricultural fields, landslide areas, wetlands, wastelands etc. which experienced major anthropogenic disturbances. Understory vegetation which were included in the sampling were majorly herbs & shrubs also including few trees. Quadrats were sampled at regular intervals of 2-3 km each. Data on vegetation, including elevation (altimeter), geographical coordinates (GPS) and the presence of disturbances or human interference were recorded. Soil samples of individual IAVPS which are highly infested were also collected for analyzing soil parameter attributes. Seed samples were also collected to study the parameters such as, rate of seed production, seed set mode of seed dispersal and their germination in the wild. In addition, seed viability, germination percent and rate of seedling establishment of the selected IAVPS shall be carried out in the laboratory of respective project partners. Diameter of all herbs/shrubs was taken about 2 cm above ground. Recorded species were preserved and identified by reference to literature in various herbaria in the country. During field surveys, 300 m altitudinal gradient range was covered for each study site. Data on frequency, density and dominance and IVI were calculated for all target species. A list of top 10 most obnoxious & top 5 neo-invasives IAVPS were made based on their IVI values. Rate of spread of selected IAVPS shall be worked out by generating temporal multi-layered maps such as, distribution map and population density map etc. using RS data, GPS, ground truthing and GIS techniques.</p>
<p>Major Research Achievements:</p>	<ul style="list-style-type: none"> ❖ Undertaken multiple field tours to Jammu & Kashmir; Himachal Pradesh; Uttarakhand; Sikkim & West Bengal; Mizoram & Tripura; Manipur, Nagaland & Arunachal Pradesh ; visited the targeted study sites ; selected experimental plots to lay quadrats ; ❖ Individual DEM maps according to 300m elevation gradient for the targeted states were prepared with the available data. ❖ Individual list of total invasive load for each state of Jammu & Kashmir; Himachal Pradesh; Uttarakhand; Sikkim & West Bengal; Mizoram & Tripura; Manipur, Nagaland & Arunachal Pradesh are completed based on the data collected till date. ❖ Phytosociological parameters for the selected IAVPS were worked out. ❖ Collected soil samples for the habitats of respective IAVPS and forest areas free from IAVPS for detail comparative analysis ❖ Herbarium voucher specimens of IAVPS were prepared and submitted to important herbaria of the country. ❖ Seed samples were collected for the top obnoxious and neo-invasives for studying their viability, germination rate and dispersal biology. ❖ Awareness programmes and workshops were conducted in 3 IHR states with over 200 audiences.
<p>Brief Conclusion - the current year progress – during the reporting</p>	<p>1) Jammu & Kashmir:</p> <p>Field surveys were carried out in Kashmir, Jammu, and Ladakh for collection, identification and inventorization of alien plant species. The geo-coordinates of</p>

period (point-wise):

thesurveyed sites and habitat typesfalling within these sites are given in Annexure I.

During the period under review 1086 plant species were collected from the study area (Annexures II) that belong to 674 genera and 71 families. Of these, 66 families are of angiosperms (55 dicot and 11 monocot families) 2 of gymnosperms and 3 are pteridophytes. Amongst angiosperms, 896 species are dicots and 177 species are monocot; 7 species belong to gymnosperms and 6 to pteridophytes. The first 5 largest families include: Asteraceae (215 species), Poaceae (116 species), Leguminaceae (95 species), Ranunculaceae (84 species), Brassicaceae (78 species) and Rosaceae (56 species). In terms of growth habit, 920 species are herbs, 115 are shrubs/sub-shrubs and 38 are trees. Among these 1086 species 850 are native and 236 are alien.

807 plant species were collected from different habitats of Ladakh. These plant species belong to 324 genera in 71 families. Of these 66 families belong to angiosperms (55 dicot and 11 monocot families), 3 to pteridophytes and 2 to gymnosperms. Amongst angiosperms, 646 species are dicots and 148 species are monocot; 7 species belong to gymnosperms and 6 species to pteridophytes. The first 5 largest families include: Asteraceae (105 species), Poaceae (95 species), Leguminaceae (49 species), Brassicaceae (43 species), Rosaceae (42 species) and Ranunculaceae (39 species). Of the 807 plant species recorded 718 species are native and 89 are alien. Amongst the alien species 49 species are invasive, 21 species are casual and 19 species are naturalized.

268 plant species were collected from Kashmir till date (Annexure II). These plant species belong to 176 genera in 57 families. Of these 57 families 45 are dicots, 9 families are monocots and one each of gymnosperms and pteridophytes. Amongst the recorded species, 217 species are dicots and 49 species are monocot, 3 gymnosperms and 1 species to pteridophytes. The first 5 largest families include: Asteraceae (39 species), Poaceae (33 species), Rosaceae (15 species) Polygonaceae (14 species) and Brassicaceae (13 species). It has been observed in the present study that 239 species are herbs, 19 shrubs, and 7 trees. Majority of the plant species are perennial (149 species) followed by annuals 104 species) and biannuals (17 species).

From Jammu region, 262 species were collected (Annexure II) and identified after undertaking field surveys in study sites. These species belonged to 189 genera and 73 families. Dicots were predominant with 232 species spread over 168 genera and 67 families. Monocots were represented by 29 species belonging to 20 genera and 5 species. One gymnosperm was recorded during the present survey. The first four largest families were Asteraceae (30 species), Fabaceae (21 species), Poaceae (17 species), and Lamaceae (12 species). The study revealed that 111 species are herbs, 25 shrubs, 47 trees and 7 climbers.

All the alien plant species collected from the three regions are listed in Annexure III. These species belong to 128 genera and 43 families; of the 37 families belong to dicotyledons and 6 to monocotyledons. Among dicotyledons, Asteraceae included the largest family number with 47 species, followed by Amaranthaceae with 14 and

Brassicaceae with 12; among monocots Poaceae was the largest family with 34 species followed by Cyperaceae with 7 and Iridiaceae with 6 species. Amongst the alien plant species majority of the species (109 species) were invasive followed by naturalized (70 species) and casual (57 species) alien plant species.

From Ladakh region, 89 alien plant species were collected (Annexure IV) and identified after undertaking field surveys in study sites. These species belonged to 57 genera and 25 families. The first four largest families were Asteraceae (16 species), Poaceae (14 species), Amaranthaceae (10 species), and Rubiaceae (6 species). The study revealed that 81 species are herbs, 5 shrubs and 3 trees.

From the Kashmir region, 175 alien plant species were collected during the present study (Annexure V). These species belonged to 115 genera in 45 families (37 families were of dicotyledons, 6 of monocotyledons, 1 of gymnosperms, and 1 of pteridophytes). Asteraceae was the largest family with 23 species followed by Fabaceae and Polygonaceae with 11 species each and in monocots Poaceae was the largest family with 21 species. Most of the species collected were annual herbs. Majority of the species are naturalized; among the naturalized taxa, 50 species are alien invasive, 49 naturalized in wild and 5 species are casual aliens.

From Jammu region, 65 plant species are alien which belongs to 57 genera and 28 families. Dicots were predominant with 57 species spread in 25 families. Monocots were represented by 10 species belonging to 6 genera and 3 families. The largest families were Asteraceae followed by Apocyanaceae. The study revealed that 50 species are herbs, 11 shrubs, 4 are trees. Majority of the alien plant species are perennial (49 species) followed by annuals (16 species).

2) Himachal Pradesh:

With the initiation of the project, two Junior Research Fellows (JRFs) and one Field Assistant was recruited. Field trips were undertaken in different habitats in different districts (Shimla, Chamba, Una, Sirmour, and Solan) and data collected was analyzed for non-native species. Specimens of plants were collected and dried to prepare herbarium sheets. Soil samples were also collected. These non-native species were further analyzed for their ecological impact through IVI. GPS coordinates and plant photographs were collected. Soil samples were stored and submitted for analysis of soil properties (under process).

3) Uttarakhand:

Surveys were carried out in various parts of the study area such as Almora, Haridwar, Nanital, Dehradun and Pauri-Gharwal of Uttarakhand. Plant species were collected and date was analyzed for nativity. During the visits, extensive photographs and GPS coordinates of sites were taken. We have recorded invasive alien species in study sites so far. Soil samples and specimens of plants were collected and dried to prepare herbarium sheets. Analysis of vegetation and physio-

chemical analysis of soil samples is in process. By calculating IVI, ecological impact was assessed.

4)Sikkim & West Bengal:

One tour were conducted in 2019 in to different regions of South, West and North Sikkim while in the year of 2020 no any tour was conducted. Phytosociological analysis of invasive alien plant species (IAPS) and its associates were done by random quadrat sampling were laid between 300 m – 2700 m altitudes, however, the survey was conducted up to 5000 m altitudes in North Sikkim. Few plots were also conducted in Darjeeling Himalaya. In Sikkim Himalaya: *Ageratina adenophora* was observed in all altitudinal gradients (300 m- 2700 m) with highest number of individuals. *Chromolaena odorata* was observed almost in all gradients but with lesser number of individuals. *Lantana camara* was observed in all gradients with scanty distribution with lowest density. *Mikania micrantha* was distributed in lower altitudes >600 m – 1200 m with high density. These species were majorly found near human habitants, along road side and shady areas where moisture was available (near waterfall). During the field study, forth targeted species that is *Ageratina riparia* was not observed.

While in Darjeeling Himalaya: Very few no. of plots was laid in between 1500m to 2100m altitudinal gradient. There were *Ageratina adenophora* noticed with highest values followed by other associates. There were no other targeted species found during field survey.

In Sikkim area, study reveals that extraordinary rapidity of some of the species like *Ageratina adenophora*, *Ageratum conyzoides*, *Bidens pilosa*, and *Tridax procumbens* are causing alarming threat along with targeted species.

5)Mizoram & Tripura:

After one year progress of the project, almost 30% work was performed through multiple field tours during 2018-2019. As With the initiation of the project, all the research personnel were recruited through a common screening test appointed in due course. All the project personnel were briefed about the objectives of the project. Literature survey was made thoroughly about the study area and all the base line information about invasive species, ecological parameters, study sites were gathered through secondary data. All the research personnel were taken to the field and given training on the basics of invasive plants, laying quadrates, collection of data. Based on elevation data and GIS, the study sites were selected and elevation maps of 1x1 sq.km. Grid maps were prepared. As a continuation of the work during 2018-2019, three more field tours were conducted in Mizoram during 2019-2020 w.e.f. 23-04-2019 to 10-05-2019 ; 09-09-2019 to 27-09-2020 and 24-02-2020 to 10-03-2020 in different seasons to collect floristic and ecological data from the selected study areas. Different protected areas of Mizoram i.e. Phawngpui National park, Murlen National park, Lengteng Wildlife Sanctuary and non-protected areas like Sangau, Tahtlang, South Vanlaiphai, West Vanlaiphai, Knahlan were visited for field works during 2019-2020. Nearly 700 more herbarium sheets were collected to ascertain added number of alien invasive load reported than last year. During this period, extensive photographs of the invasive plants were taken and GPS data were recorded using **Garmin Montana 680** device to keep track of the quadrat sampling points. Quantitative analysis of the invasive plants particularly of *Mikania micrantha* and *Ageratina adenophora* were done. Associated invasive alien plants like *Ageratum conyzoides*, *Lantana camara*, *Chromolaena odorata* and *Parthenium hysterophorus* were also reported with their Importance Value Index.

Plant specimens of the invasive plants were collected and dried and preserved properly for preparing herbarium sheets. An added number of 30 alien species during 2019-2020.

As a part of the project objective, it is essential to interact with the local stakeholders like university students, NGOs, forest department officials and local farmers who can directly or passively take part in evaluating the ecological investigation of the targeted invasive plants. Awareness programmes are the most effective way to interact with the local stakeholders. Keeping in mind the importance of awareness programmes, “**A one day Awareness Programme cum Workshop on Invasive Alien Plants in Himalayas: Status, Ecological Impact and its Management**” was conducted in **26th April, 2019** at **Mizoram University Campus** with an targeted audience of more than 60 participants from different areas of Mizoram.

Rabishankar Sengupta, a junior Project fellow of this project, presented two posters in two important International Conferences under the supervision of Dr.S.S.Dash, Scientist-E & Project Partner. Rabishankar Sengupta attended & presented a poster on the topic “A comparative taxonomic account of three invasive alien species of Eupatorium in Mizoram” in International Conference on “Algae, Fungi & Plants: Systematics to Applications” on 24-25th January, 2020 at Kolkata. He also presented a poster on the topic “A comprehensive inventory of invasive alien plants in Tripura” in BSI International symposium on Plant Taxonomy and Ethno botany 2020 at Kolkata.

One research paper regarding the inventory & ecological status of top 10 obnoxious invasive alien plants in Mizoram is also communicated in a peer reviewed international journal on 21st March, 2020.

6) Manipur, Nagaland & Arunachal Pradesh:

During the period, several localities of Arunachal Pradesh and Manipur were surveyed considering elevation ranges. An additional 14 new IAVPS were recorded during this period, accounting to cumulative of 73 species till date to the last year's 59 recorded species. The new additions include highly invasive species like, *Ageratina riparia*, *Asclepias curassavica*, *Alternanthera philoxeroides* in Manipur and *Lippia alba* from Arunachal Pradesh. The following noxious IAVPS viz *Ageratina adenophora*, *Ageratum conyzoides*, *Ageratum houstonianum*, *Bidens pilosa*, *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha*, *Parthenium hysterophorus*, *Tithonia diversifolia*, *Galinsoga quadriradiata*, *Artemisia nilagirica* were identified and recorded. New sets of DEMs according to 300m elevation gradient were prepared for each of the three states. GPS locations of all the species recorded were extrapolated on the DEM maps. All of the above-mentioned species were recorded except *P. hysterophorus* and *G. quadriradiata* at various localities during the field investigation. *P. hysterophorus* was absent in the hill and inside forest areas while it was observed growing in dense populations near human habitations. The presence of IAVPS was found to be almost absent in elevations more than 1500m asl in Arunachal Pradesh, where only less populations of *Ageratum spp.* and *A. adenophora* were observed. The population of *Mikania micrantha*, *A. conyzoides*, *A. houstonianum* and *Bidens pilosa* at higher elevations was also found to be comparatively less than lower elevation plots.

For the phytochemical analysis, chlorophyll contents of the selected IAVPS were extracted and estimated with photometric analysis. Analysis of soil parameters of different soils collected from different localities was done and soil data for the invaded sites with respect to various IAVPS were generated. As part of livelihood options, vermicomposting experiments were conducted utilizing the shoot parts of five IAVPS and their nutrient contents were analysed. The total phosphorus content and the total potassium content increased two-fold with that of raw dung indicating that all the composts harvested have high nutrient values. The experimental data suggest that

	<p>selected invasive species are potential sources for the utilization of organic compost. Germination tests were conducted for four species. <i>A. conyzoides</i>, <i>A. houstonianum</i>, and <i>M. micrantha</i> showed a highly successful rate of germination while <i>L. camara</i> all of the seeds failed to germinate.</p>
Progress Achieved (%):	<ul style="list-style-type: none"> ❖ 50%
Remaining work to be done:	<ul style="list-style-type: none"> ❖ Preparing protocols for prediction, early detection and risk assessment of IAVPS ❖ Assessment of Ecological & Environmental Impact of invasion and spread with special reference to phytodiversity and soil especially in relation to climate change; This will include the level of disappearance of native species ❖ Identification of a cross-sectoral group to assess the situation in the form of case-studies on these species, and also to formulate workable management strategies aiming to prediction, prevention and control . ❖ Determining biodiversity threat level from the spread of these two invasive plants. ❖ To study the similarities and differences in spread pattern and invasive load on early recovery successional landscapes, and its impact on natural flora.

Utilization Certificates
PI: Prof. Zafar A Reshi

Expenditure Statement and Utilization Certificate

NATIONAL MISSION ON HIMALAYAN STUDIES
(Statement showing the expenditure for the period from 01-04-2019 To 31-03-2020 of that Financial year 2019-20)

Sanction No. & Date: **CUPB/EUST/07/05/2018/1207 Dated:- 07-05-2018**

Total outlay of the project: **Rs. 63, 17,000.00**

1. Date of Start of the Project: **7th - May- 2018**

2. Duration: **3-Years (Three years)**

3. Date of Completion: **May 2021**

a. Amount received during the financial year (2019-20): **Rs. Nil**

b. Opening balance from previous financial year(2018-19): **Rs. 19,02,363.00**

Total amount available for Expenditure (a+b+c) (2019-20): **Rs. 19,02,363.00**

S.No.	Budget head	Opening Balance	Amount received	Opening Balance + Amount received	Actual Expenditure Incurred	Committed Expenditure	Total amount Expenditure	Unspent Balance/ Excess(-) Saving (IX=V-VIII)
1	II	III	IV	V=III+IV	VI	VII	VIII=VI+VII	IX=V-VIII
1	Salaries	3,11,001.00	-	3,11,001.00	3,05,000.00	25,000.00	3,30,000.00	(18,99)
2	permanent Equipment Purchased Item-wise	10,64,354.00	-	10,64,354.00	-	-	-	10,64,35
3	Other expenditure & Software	2,00,000.00	-	2,00,000.00	35,090.00	-	35,090.00	1,64,9
4	Chemical & Glassware	2,233.00	-	2,233.00	-	50,294.00	50,294.00	(48,06)
5	Transport & Travel	7,039.00	-	7,039.00	6,345.00	1,97,478.00	2,03,823.00	(1,96,78)
6	Contingency	33,857.00	-	33,857.00	33,460.00	58,701.00	92,161.00	(58,30)
7	Activities	2,19,548.00	-	2,19,548.00	-	-	-	2,19,5
8	Institutional charges	-	-	-	-	-	-	-
9	Interest earned / accrued	64,331.00	-	64,331.00	-	-	-	1,03,81
10	Total	19,02,363.00	Nil	19,02,363.00	3,79,895.00	3,31,473.00	7,11,368.00	12,30,54
11	Amount allowed to be Carried forward to the next financial year							12,30,54

Note : An amount of Rs. 39,551/- earned /accrued as interest from bank during the year 2019-20.

* Authorization for its Utilization awaited

Prof. Zafar A Reshi
Principal Investigator
NMHS SC
Department of Botany
University of Kashmir

Director Finance

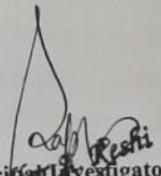
Dean Research

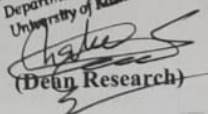
For Amir Jan & Assoc
Chartered Accountant
FRN 021905

...the expenditure of Rs.7,11,368.00 (Rupees Seven Lakh Eleven Thousand Three
... Sixty Eight only) (Including Committed Expenditure of Rs. 3,31,473.00/-)
... Sr. no.7 was actually incurred on the project/scheme for the purpose it was

Date: OUR REF. No.

NO. CUPB/EUST/07/05/2018/1207
Dated:- 07-05-2018



(Principal Investigator)
Prof. Zafar Reshi
Principal Investigator
NMHS Scheme "Invasive alien plants in Himalayas:
Ecological Impact and Management"
Department of Botany
University of Kashmir


(Dean Research)
Dean Research
University of Kashmir

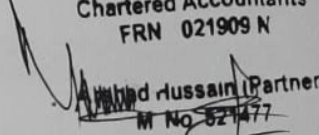
ACCEPTED AND COUNTERSIGNED

Date:

COMPETENT AUTHORITY
NATIONAL MISSION ON HIMALAYAN STUDIES (GBPNIHESD)


(Director Finance)

Director Finance
(JR, Accounts)
University of Kashmir, Sgr.

(Chartered Accountant)
For Amir Jan & Associates
Chartered Accountants
FRN 021909 N

Amir Jan (Partner)
M No 621477

UTILIZATION CERTIFICATE NMHS-PMU, G.B.PANT NATIONAL INSTITUTE OF HIMALAYAN ENVIRONMENT & SUSTAINABLE DEVELOPMENT, KOSI, KATARMAL, ALMORA, UTTARAKHAND
(To be sent in duplicate)

(For the period from 01-04-2019 to 31-03-2020 of that Financial year 2019-20)

1	Title of the project/Scheme/Programme	"Invasive Alien Plants in Himalayas: Status, Ecological impact and Management"
2	Name of the Principle Investigator & Organization.	Prof. Zafar A Reshi, Dep't. Of Botany, University of Kashmir, Srinagar. J & K India
3	NMHS-PMU, G.B.Pant National Institute of Himalayan Environment& Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No and date of sanctioning the project.	CUPB/EUST/07/05/2018/1207 Dated:- 07-05-2018
4	Opening balance from the previous financial year, quoting the NMHS-PMU, G.B.Pant National Institute of Himalayan Environment& Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No. and date on which the Authority to carry forward the said amount was given	Rs. 19,02,363.00
5	Amount received from NMHS-PMU, G.B.Pant National Institute of Himalayan Environment& Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand during the financial year (2019-20) (Please give number and dates of sanction orders showing the amount paid)	Rs. Nil
6	Total amount that was available for expenditure (Including commitments) incurred during the financial year (2019-20) (S.No.4+5)	Rs. 19,02,363.00
7	Actual expenditure (Including commitments) incurred during the financial year (2019-20).	Rs. 7,11,368.00
8	Unspent Balance amount refunded, if any: (Please give details of cheque no. etc.)	Rs. Nil
9	Balance amount available at the end of financial year 2019-20	Rs. 11,90,995.00
10	Accrued bank Interest during the year 2019-20	Rs. 39,551.00
11	Amount allowed to be Carried forward to the next financial year 2020-21	Rs. 12,30,546.00

Zafar A Reshi
Prof. Zafar A Reshi
Principal Investigator
NMHS Scheme "Invasive alien plants in Himalayas"
Ecological Impact and Management
Department of Botany
University of Kashmir

Deen Research
(Deen Research)

Dean Research
University of Kashmir

(Signature)
(Director Finance)
Director Finance
(JR, Accounts)
University of Kashmir, Sgr.

(Chartered Accountant)
For Amir Jan & Associates
Chartered Accountants
FRN 021909 N
(Signature)
M No 52147

pI: Prof. Daizy R. Batish

UTILIZATION CERTIFICATE NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand
(To be sent in duplicate)

For the financial year 2019-2020

1.	Title of the project/	Ecological Studies on the Rapidly Establishing Invasive Alien Plants in the Middle and Lower Regions of Himachal Pradesh
2.	Name of the Principal Investigator & Organization.	Dr. Daizy R. Batish Professor, Dept. Botany, Panjab University, Sector 14, Chandigarh
3.	NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No and date of sanctioning the project	NMHS-2017/LG-01/475 dated 22/12/2017
4.	Amount brought forward from the previous financial year, quoting the NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No. and date on which the Authority to carry forward the said amount was given	36,33,400 Letter no. NMHS-2017/LG-01/475/494/406 Dated: 23/1/2020
5.	Amount received from NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand during the financial year (2019-2020) (Please give number and dates of sanction orders showing the amount paid)	NIL
6.	Total amount that was available for expenditure (Including commitments) incurred during the financial year (2019-2020) (S.No.4+5)	36,33,400
7.	Actual expenditure (excluding commitments) incurred during the financial year (2019-2020)	30,85,732
8.	Unspent Balance amount refunded, if any: (Please give details of cheque no. etc.)	NIL
9.	Balance amount available at the end of financial year	5,47,868 Fellowship not paid since January 2020
10.	Accrued bank Interest (2019-2020)	1,28,019
11.	Total Balance amount available at the end of financial year	6.75.687

Certified that the expenditure of Rs. 30,85,732 (Rupees Thirty lakh eighty five thousand seven hundred and thirty two only) mentioned against Sr. no.7 was actually incurred on the project/scheme for the purpose it was sanctioned.

Date:


 Signature of Principal Investigator Signature of Registrar/Finance Officer Signature of Head of the Organization
Principal Investigator
 Department of Botany
 Panjab University
 Chandigarh-160030
 Our REF No. _____
 ACCEPTED AND COUNTERSIGNED

Date:

Competent Authority
NATIONAL MISSION ON HIMALAYAN STUDIES (GBPIHESD)

**EXPENDITURE STATEMENT
NATIONAL MISSION ON HIMALAYAN STUDIES**

Statement showing the expenditure of the period from 1 April, 2019 to March 31, 2020

Sanction No. & Date.: NMHS-2017/LG-01/475 dated 22/12/2017;
letters CUPB/CC/Accts/2018-2019/249/627 dated 23/5/18 (for Rs. 25,00,00/=) and
CUPB/CC/Accts/2018-2019/250/626 dated 23/5/18 (for Rs 17,65,000/=)

1. Total Outlay of the Project : Rs. 74,17,000
2. Date of Start of the Project :
3. Duration : Three years
4. Date of Completion :
a) Amount received during the financial year (2018-2019) : NIL
b) Unspent Amount carried forward from the previous year : Rs. 36,33,400
c) Total amount available for expenditure (a + b) : Rs. 36,33,400

S.No.	Budget Head	Amount Carried Forward	Amount received	Amount received+ amount carried forward	Expenditure	Amount Balance/ Excess expenditure
1	Salaries	4,00,710	--	4,00,710	4,06,000*	-5290
2	Permanent Equipment Purchased (item-wise)	25,00,000	--	25,00,000	24,99,075	925
3	Travel & Transport	1,88,115	--	1,88,115	1,30,267**	57,848
4	Contingency	NIL	--	NIL	--***	--
5	Chemical	7,391	--	--	6900***	491
6	Activities	2,38,510	--	2,38,510	43,490	1,95,020
7	Other expenditure (Software)	2,00,000	--	2,00,000	NIL****	2,00,000
8	Institutional charges	NIL		NIL	NIL	NIL
9	Accrued bank Interest	98,674	1,28,019			2,26,693
10	Total	36,33,400		36,33,400	30,85,732	6,75,687
11	Amount allowed to be Carried forward to the next financial year					

Certified that the expenditure of Rs. __ 30,85,732 __ (Rupees Thirty lakh eighty five thousand seven hundred and thirty two only) mentioned against Sr. no.10 was actually incurred on the project/scheme for the purpose it was sanctioned.

Date:



(Signature of Registrar/Investigator) Signature of Registrar/Finance Officer (Signature of Head of the Organization)

Principal Investigator
Our REF No. :
Department of Botany

ACCEPTED AND COUNTERSIGNED
Chandigarh-160014, India

Date:
Competent Authority
NATIONAL MISSION ON HIMALAYAN STUDIES (GBPIHESD)

* Salary to staff has not been paid since January 2020
** Some bills are pending and could not be paid due to lockdown in March; shall be paid during 2020-2021.
*** The grant for Chemicals and Contingency was not sanctioned/ received for 2019-2020, so the bills are pending
**** The payment got delayed due to sudden lockdown in March and will be paid during this financial year

PI: Prof. Harminder Pal Singh


UTILIZATION CERTIFICATE NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand
(To be sent in duplicate)

For the financial year __2019-2020

1.	Title of the project/	Invasive Alien Plants in the Himalayan Region of Kinnaur District of Himachal Pradesh and Utrakhnad: Status and Risk Assessment
2.	Name of the Principle Investigator & Organization.	Dr. Harminder Pal Singh Professor, Dept. Environment Studies, Panjab University, Sector 14, Chandigarh
3.	NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No and date of sanctioning the project	NMHS-2017/LG-01/475 dated 22/12/2017
4.	Amount brought forward from the previous financial year, quoting the NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand Letter No. and date on which the Authority to carry forward the said amount was given	36,30,936 Letter no. NMHS-2017/LG-01/475/494/406 Dated: 23/1/2020
5.	Amount received from NMHS-PMU, G.B.Pant National Institute of Himalayan Environment & Sustainable Development, Kosi, Katarmal, Almora, Uttarakhand during the financial year (2019-20) (Please give number and dates of sanction orders showing the amount paid)	NIL
6.	Total amount that was available for expenditure (Including commitments) incurred during the financial year (2019-2020) (S.No.4+5)	36,30,936
7.	Actual expenditure (excluding commitments) incurred during the financial year (2019-20)	26,13,590 (Fellowship not paid since July 2019)
8.	Unspent Balance amount refunded, if any: (Please give details of cheque no. etc.)	NIL
9.	Balance amount available at the end of financial year (on 31/03/2020)	10,17,346
10.	Accrued bank Interest (2019-2020)	1,42,324
11.	Total Balance amount available at the end of financial year	11,59,670** (Fellowship not paid since July 2019)
12.	Amount allowed to be carried forward to the next financial year vide Letter No. and dated	

Certified that the expenditure of Rs. 26,13,590 (Rupees Twenty six lakh thirteen thousand five hundred and ninety only) mentioned against Sr. no.7 was actually incurred on the project/scheme for the purpose it was sanctioned.

Date:


 (Signature of Principal Investigator) Signature of Registrar/Finance Officer) (Signature of Head of the Organization)
Principal Investigator
Department of Environment Studies
Panjab University, Chandigarh

** Amount should not be made due to Covid 19 Lockdown.

Our REF No.

ACCEPTED AND COUNTERSIGNED

Date:

Competent Authority
NATIONAL MISSION ON HIMALAYAN STUDIES (GBPIHESD)

EXPENDITURE STATEMENT
NATIONAL MISSION ON HIMALAYAN STUDIES

Statement showing the expenditure of the period from 1 April 2019 to March 31, 2020

Sanction No. & Date: NMHS-2017/LG-01/475 dated 22/12/2017,
letters CUPB/CC/Accts/2018-2019/249/627 dated 23/5/18 (for Rs. 25,00,00/=) and
CUPB/CC/Accts/2018-2019/250/626 dated 23/5/18 (for Rs 17,65,000/=)

1. Total Outlay of the Project	:	Rs. 74,17,000
2. Date of Start of the Project	:	
3. Duration	:	Three years
4. Date of Completion	:	
a) Amount received during the financial year (2019-2020)	:	Rs. NIL
b) Unspent Amount carried forward from the previous year	:	Rs. 36,30,936
c) Total amount available for expenditure (a + b)	:	Rs. 36,30,936

S.No.	Budget Head	Amount Carried Forward	Amount received	Amount received+ amount carried forward	Expenditure	Amount Balance/ Excess expenditure
1	Salaries	2,90,323	--	2,90,323	2,90,323*	--
2	Permanent Equipment Purchased (item-wise)	25,00,000	--	25,00,000	20,85,744**	4,14,256
3	Travel & Transport	2,41,655	--	2,41,655	2,37,523	4,132
4	Contingency	351	--	351	--***	351
5	Chemical	NIL	--	NIL	--***	--
6	Activities	3,00,000	--	3,00,000	--	3,00,000
7	Other expenditure (Software)	2,00,000	--	2,00,000	--****	2,00,000
8	Institutional charges	NIL	--	NIL	--	NIL
9	Accrued bank Interest	98,607	1,42,324	98,607	--	2,40,931
10	Total	36,30,936	--	36,30,936	26,13,590	11,59,670
11	Amount allowed to be Carried forward to the next financial year					

Certified that the expenditure of Rs. 26,13,590/= (Rupees Twenty six lakh thirteen thousand five hundred and ninety only) mentioned against Sr. no.7 was actually incurred on the project/scheme for the purpose it was sanctioned.

Date:

(Signature of Principal Investigator) (Signature of Registrar/Finance Officer) (Signature of Head of the Organization)

Principal Investigator
Department of Environment Studies
Panjab University, Chandigarh

ACCEPTED AND COUNTERSIGNED

Date:

Competent Authority
NATIONAL MISSION ON HIMALAYAN STUDIES (GBPIHESD)

* Salary to staff has not been paid since July 26, 2019

** The payment of equipment got delayed due to sudden lockdown in March and will be paid during this financial year.

*** The grant for Chemicals and Contingency was not sanctioned/ received for 2019-2020, so the bills are pending

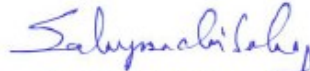
**** The payment got delayed due to sudden lockdown in March and will be paid during this financial year.

UTILISATION CERTIFICATE
(BOTANICAL SURVEY OF INDIA, KOLKATA)

Details of Expenditure: From April,2018 to June,2020:

1	Title of the Project/ Scheme/ Programme	"Ecological Investigations to understand causes and consequences of invasion in Tripura and Mizoram"
2a.	Name of the Principal Investigator & Organization	Prof. Vinod Kumar Garg Central University of Punjab, Bathinda
2b.	Name of the Project Partner & Organization	Dr. S.S. Dash, Scientist-E, BSI, Kolkata
3.	Project No. and date of Sanctioning of the Project	NMHS-2017/LG/01/475 , Date:- 22/12/17
4.	Amount received from PI (Central University of Punjab, Bathinda) during financial year 2018-2019	Rs. 20,15,000
6.	Total amount that was available for Expenditure (including Equipment's) incurred during the financial year 2018-19.	Rs. 20,15,000
7.	Actual Expenditure (excluding commitments) incurred during the financial year (2019-20) up to 30.06.2020.	Rs. 16,65,154
8.	Committed expenditure	Rs. 2,50,000
9.	Bank Charges towards NEFT & SMS charges	Rs. 364
10.	Unspent balance amount refunded, if any	Rs. 99,482
11.	Balance amount available at the end of financial year 2019-20 and as on 31.03. 2020.	Rs. 99,482
12.	Amount allowed to carry forward to the next financial year vide letter No. and dated	NA
13.	Actual Bank Interest	Rs. 78,335 (11936 + 17634+15699+12776+8228+6710+5352)

Certified that the expenditure of Rs. 16, 65,154 /- (Rupees Sixteen Lakhs Sixty Five Thousand One Hundred And Fifty Four Only) mentioned against Sr. No. 7 Bank charges towards NEFT & SMS charges of Rs. 364.00 /- (Rupees Three Hundred Sixty Four only) mentioned against Sr. No. 9 was actually incurred on the project as on 30.06.2020 for the purpose it was sanctioned and also committed expenditure is Rs. 2, 50,000/- (Rupees Two Lakh Fifty Thousand only) against Sr. no. 8. The unspent balance amount Rs. 99,482/- plus Interest received from bank Rs.78, 335/- = Rs. 1, 77, 817/- (Rupees One Lakh Seventy Seven Thousand Eight Hundred and Seventeen Only) is in hand up to 30.06.2020.


(Sabyasachi Saha) 17/6/2020

Signature of the Drawing & Disbursing Officer

Botanical Survey of India

आदरण व खर्चकारि अधिकारी
Drawing & Disbursing Officer
भारतीय वनस्पति सर्वेक्षण
Botanical Survey of India
सो.जी.ओ. समालोचक, साइट लेक विटि
CGO Complex, Salt Lake City
कोलकाता-700064


(Dr.S.S.Dash) 15/6/2020

Signature of Project Partner, NHMS Project (L.G)
Botanical Survey of India

Scientist-E & Project Partner
Invasive Alien Plants in Himalayas Project
Botanical Survey of India
Kolkata- 700064

STATEMENT OF EXPENDITURE FROM APRIL,2018 TO JUNE,2020

SL.NO	FINANCIAL POSITION/BUDGET HEAD	FUNDS SANCTIONED	EXPENDITURE UPTO 30 TH JUNE,2020	BALANCE AS ON 30 TH JUNE,2020	REMARK FOR COMMITTED EXPENDITURE
1.	SALARIES/MANPOWER COST	7,20,000	7,00,168	19,832	NIL
2.	TRAVEL	3,00,000	2,99,880	120	NIL
3.	EXPANDEBLES & CONSUMABLES (CHEMICALS AND GLASSWARE'S)	1,00,000	95,000	5,000	NIL
4.	CONTINGENCIES	1,25,000	1,24,406	594	NIL
5.	ACTIVITIES & OTHER PROJECT COST	3,00,000	3,00,000	000	NIL
6.	INSTITUTIONAL CHARGES	20,000	NIL	20,000	NIL
7.	OTHER EXPENDITURES SOFTWARE'S FOR ECOLOGICAL ANALYSIS ETC.	2,00,000	NIL	2,00,000	1,50,000
8.	EQUIPMENTS	2,50,000	1,45,700	1,04,300	1,00,000
	TOTAL	20,15,000	16,65,154	3,49,846	2,50,000
9.	INTEREST RECEIVED FROM BANK UPTO 30 TH JUNE,2020 AND LESS RTGS CHARGES	78,335	364	77971	NIL
	TOTAL INCLUDING INTEREST	20,93,335	16,65,518	4,27,817	2,50,000

Sabyasachi Saha
15/6/2020

(Sabyasachi Saha)
Signature of the Drawing & Disbursing Officer

Botanical Survey of India
आह्वान व संचितरण अधिकारी
Drawing & Disbursing Officer
आह्वान व संचितरण अधिकारी
Botanical Survey of India
प्री.जी.ओ. बसन्तवेल्ल, साइट लेक सिटी
CGO Complex, Salt Lake City
कोलकाता-700 064

(Dr. S.S. Dash)
15/6/2020

(Dr. S.S. Dash)
Signature of Project Partner, NHMS Project (LG)
Botanical Survey of India

Scientist-E & Project Partner
Invasive Alien Plants in Himalayas Project
Botanical Survey of India
Kolkata- 700064

LIST OF PLANTS & DATA ANALYSIS

(Jammu, Kashmir and Ladakh)

Sampling design and data collection:

The study area was divided into grids of 6.25×6.25 km and grids were selected for survey in a manner that the entire areas and habitats were well represented (Fig.1). In each of the selected grids, 1-3 transects were in different directions to cover the entire area and subsequently quadrat sampling was undertaken for field samplings of trees, shrubs, sub-shrubs, herbs and other growth forms of plants and to compute frequency, density and abundance. Minimum requisite size of quadrats for trees was 10 m², 5 m² for shrubs and 1 m² for herbs. After every 2 km and with 300 meter altitudinal range the quadrates were laid down. Sampling unit selection was performed by randomly lying down about 50 quadrats at each sampling site in each natural environment; the number of quadrates was proportional to the area of habitat types. The complete inventory of plant species occurring in each habitat was documented along with ecological attributes. During field surveys, detailed field observations, including notes on habitat type, life span category, growth forms, altitude, latitude and longitude were recorded in the field notebook. The collected specimens of plants were handled using standard herbarium techniques, and classified using appropriate taxonomic literature and protocols. In some cases the identifications were confirmed from herbarium specimens already identified at the University of Kashmir Herbarium (KASH).

The plant species collected from the study area were assigned a category of growth form, such as herb, shrub, and tree, based on field observations. Likewise, a type of life span (i.e. annual, biennial or perennial) was assigned to each alien plant species based on the field observations, supplemented with standard sources, such as e-floras. The native distribution range was assigned a plant species using GRIN-Germplasm Resources Information Network (<http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl>). Other sources, such as Catalogue of Life 2016 (<http://www.catalogueoflife.org/col/search/all>), and published scientific literature were also used

Purpose of introduction

The purpose of introduction of the recorded alien plant species was carried out by perusal of relevant literature, interaction with local people regarding the method of introduction of these alien plants supplemented with field observation and proficient taxonomic expertise. The introduced alien flora were divided into six main categories; namely, Seed infestation, fodder, medicines, ornamental and plantations. The alien plant species with no previous record were recorded as unintentional.

Invasion status

The invasion status of the alien flora was primarily assigned using field observations and standard published scientific literature. Following standard conceptual framework has been adopted for delimiting various categories of alien species (Fig. 2).

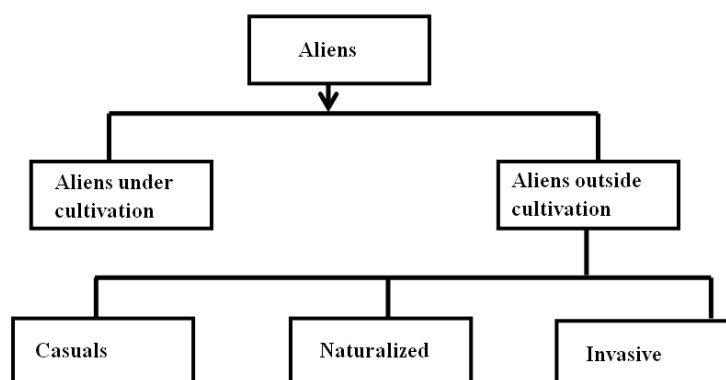


Fig. 2: Categories of alien species recognized during the present study.

In the present study, frequency percentage (FP) and abundance were used to assign the invasion stage to an alien species (Table 1).

Table 1: Criteria for characterization of alien plant species

Stages of invasion	Description	Criterion
Stage 0	Potential AIS (or their propagules) in their native range(s)	Not applied
Stage I	Potential AIS (or their propagules) in the transport vectors	Not applied
Stage II	AIS (or their propagules) released and introduced into their non-native range(s)	<10% FP & <10% CP
Stage III	AIS that reproduce and establish their populations in the non-native range (s)	<20% FP & <10% CP
Stage IV a	AIS become widespread in distribution but form populations with limited number of individuals	>50% FP & >10% CP
Stage IV b	AIS remain localized distribution but form abundant populations	<50% FP & > 50% CP
Stage V	AIS become widespread in distribution and form abundant populations	>50% FP & > 50% CP

Frequency percentage (FP) is a measure of occurrence across sites, while cover percentage (CP) is a measure of abundance within sites.

Results& outcome

In the present study 73 collection sites have been surveyed in J&K and Ladakh to record the plant diversity and invasion load. The geographical co-ordinates of the selected sites were recorded using geographical positioning system (GPS).

Surveys were carried out in various parts Kashmir, Jammu& Ladakh. It is pertinent to mention that the Ladakh is largely unexplored in respect of alien species and also the flora of Ladakh has a considerable biological interest with respect to its diversity, origin, endemism and high adaptableness to extreme climatic conditions and biotic pressures.

(A) Floristic diversity recorded in Jammu, Kashmir and Ladakh regions:

During present study 1086 plant species were collected from the study area, that belonged to 610 genera 71 families. Of these 71 families belong to angiosperms (66 dicot and 9 monocot families), 2 to gymnosperms and 3 to pteridophytes. Amongst angiosperms, 896 species are dicots and 177 species are monocot; 7 species belong to gymnosperms and 6 species to pteridophytes. The first 5 largest families include: Asteraceae (180 species), Poaceae (116 species), Leguminaceae (95 species), Ranunculaceae (84 species), Brassicaceae (78 species) and Rosaceae (56 species) (Table 2). During the present study the diversity and invasion load of the study sites were recorded and from the recorded plant species most of these are herbs and also amongst this largest number of plants are perennial (Figs. 3 and 4). The percentage of native and alien plant species is depicted in Fig.5.

Diversity of plant species recorded from Jammu, Kashmir and Ladakh

Name of species	Family	Plant Group	Life cycle	Habit	Distributional Range
<i>Abu sprecaorius</i> L.	Leguminaceae	Dicot	Perennial	Climber	J&K
<i>Abutilon abutiloides</i> (Jacq.) Garcke ex Hochr.	Malvaceae	Dicot	Annual	Shrub	J&K
<i>Abutilon bidentatum</i> Hochst. ex A.Rich	Malvaceae	Dicot	Perennial	Shrub	J&K
<i>Abutilon hirsutum</i> (Vell.) K.Schum.	Malvaceae	Dicot	Perennial	Shrub	J&K
<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Dicot	Perennial	Shrub	J&K
<i>Abutilon ramosum</i> A.St.-Hil.	Malvaceae	Dicot	Perennial	Shrub	J&K
<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Leguminaceae	Dicot	Perennial	Tree	J&K
<i>Acacia catechu</i> (L.f.) Willd.	Leguminaceae	Dicot	Perennial	Tree	J&K
<i>Acacia farnesiana</i> (L.) Willd	Leguminaceae	Dicot	Perennial	Tree	J&K
<i>Acacia modesta</i> Wall.	Leguminaceae	Dicot	Perennial	Tree	J&K
<i>Acacia nilotica</i> (L.) Delile	Leguminaceae	Dicot	Perennial	Tree	J&K
<i>Acantholimon lycopodioides</i> (Girard) Boiss.in DC.	Plumbaginaceae	Dicot	Perennial	Shrub	J&K
<i>Achillea millefolium</i> L.	Asteraceae	Dicot	Perennial	Herb	J&K
<i>Achyranthes aspera</i> L.	Amaranthaceae	Dicot	Perennial	Herb	J&K
<i>Achyranthes tomentosa</i> L.	Amaranthaceae	Dicot	Perennial	Herb	Jammu
<i>Aconitum violaceum</i> Jacquem. ex Stapf.	Ranunculaceae	Dicot	Perennial	Herb	Jammu
<i>Aconogonon tortuosum</i> (D.Don) H.Hara.	Polygonaceae	Dicot	Perennial	Herb	Jammu
<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Dicot	Perennial	Tree	Jammu
<i>Ageratum conyzoides</i> Sieber ex Sieber ex Steudel	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Ageratum houstonianum</i> Mill.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Agrostis filipes</i> Hook.f	Poaceae	Monocot	Annual	Herb	Jammu
<i>Agrostis gigantea</i> Roth	Poaceae	Monocot	Perennial	Herb	Jammu

<i>Agrostis munroana</i> Aitch. &Hemsl.	Poaceae	Monocot	Perennial	Herb	Jammu
<i>Ajania fruticulosa</i> Paljak	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Ajania tibetica</i> (Hook.f. & Thomson) Tzvelev.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Ajuga parviflora</i> Benth.	Lamiaceae	Dicot	Annual	Herb	Jammu
<i>Albizzia berteriana</i> (DC.) M.Gomez	Leguminaceae	Dicot	Perennial	Tree	Ladakh
<i>Albizzia lebbeck</i> (L.) Benth	Leguminaceae	Dicot	Perennial	Tree	Ladakh
<i>Allium areoprasum</i> L.	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium carolinianum</i> DC.	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium platyspathum</i> Schrenk	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium przewalskianum</i> Regel	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium rubellum</i> C.Presl	Amarylidaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium sativum</i> L.	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium schoenoprasum</i> L.	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Allium stoliczkae</i> Regel	Alliaceae	Monocot	Perennial	Herb	Ladakh
<i>Alstonia scholaris</i> (L.) R.Br.	Apocyanaceae	Dicot	Perennial	Tree	Ladakh
<i>Althaea rosea</i> Cav.	Malvaceae	Dicot	Biennial	Herb	Ladakh
<i>Althea rosa</i> L.	Rosaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Amaranthus caudatus</i> L.	Amaranthaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Amaranthus hybridus</i> L.	Amaranthaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Amaranthus powellii</i> S.Watson	Amaranthaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Anagalis arvensis</i> L.	Primulaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Anaphalis nubigena</i> DC.	Asteraceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Anaphalis virgata</i> Thomos.	Asteraceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Androsace baltistanica</i> Y.J.Nasir.	Primulaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Androsace robusta</i> (R.Knuth) Hand.-Mazz.	Primulaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Androsace rotundifolia</i> Hardw.	Primulaceae	Dicot	Annual	Herb	J&K, Ladakh

<i>Anemone rupicola</i> Cambess.	Ranunculaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Anthemis cotula</i> L.	Asteraceae	Dicot	Biennial	Herb	J&K, Ladakh
<i>Aphragmus ladakianus</i> Al-Shehbaz.	Boraginaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Aphragmus oxycarpus</i> (Hook.f. & Thomson) Jafri.	Boraginaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Aquilegia fragrans</i> Benth.	Ranunculaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Aquilegia moorcroftiana</i> Wall. ex Royle.	Ranunculaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Arabidopsis thaliana</i> (L.) Heynh.	Brassicaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Arabis tibetica</i> Hook.f. & Thomson	Brassicaceae	Dicot	Biennial	Herb	Ladakh
<i>Arctium lappa</i> L.	Asteraceae	Dicot	Biennial	Herb	Ladakh
<i>Arenaria bryophylla</i> Fernald.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Arenaria neelgerrensis</i> Wight & Arn.	Caryophyllaceae	Dicot	Annual	Herb	Ladakh
<i>Arenaria serpyllifolia</i> L.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Argemone mexicana</i> L.	Papaveraceae.	Dicot	Perennial	Herb	Jammu
<i>Argentina anserina</i> (L.) Rydb.	Rosaceae	Dicot	Perennial	Herb	Ladakh
<i>Arnebiaeuchroma</i> (Royle) I.M. Johnst.	Boraginaceae	Dicot	Perennial	Herb	Ladakh
<i>Arnebia guttata</i> Bunge.	Boraginaceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia absinthium</i> L.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia brevifolia</i> Wall. ex DC.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia fragrans</i> Willd.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia indica</i> Wild.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia moorcroftiana</i> Wall.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia persica</i> Boiss.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia salsoloides</i> Willd.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia santolinifolia</i> Turcz. ex Besser.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia scoparia</i> Waldst. & Kitam.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia siversiana</i> Ehrh. ex Willd.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia stracheyi</i> Hook.f. & Thomson ex C.B. Clarke.	Asteraceae	Dicot	Perennial	Herb	Ladakh

<i>Artemisia stricta</i> Edgew.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Artemisia tournefortiana</i> Rchb.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Arthraxon prionodes</i> Dandy.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Arundo donax</i> L.	Poaceae	Monocot	Perennial	Herb	Jammu
<i>Askellia flexuosa</i> (Ledeb.) W.A. Weber	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Askellia naniformis</i> (Babc.) Sennikov	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Asparagus</i> spp.	Liliaceae	Monocot	Annual	Herb	Jammu
<i>Aster flaccidus</i> Bunge.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Astragalus confertus</i> Bunge.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus densiflorus</i> Kar. & Kir.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus grahamianus</i> Royle ex Benth.	Papilionaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Astragalus hendersonii</i> Baker.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus heydei</i> Baker	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus hoffmeisteri</i> (Klotzsch) Ali.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus melanostachys</i> Bunge.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus munroi</i> Bunge.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus nivalis</i> Kar. & Kir.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Astragalus oplites</i> Benth. ex R. Parker.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Astragalus rhizanthus</i> Royle ex Benth. in Royle.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Astragalus strictus</i> Grah. Ex Benth	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Astragalus thomsonii</i> Podlech.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Astragalus tribulifolius</i> Benth. ex Bunge	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Asyneum thomsonii</i> Bornm	Campanulaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Atriplex pamirica</i> Iljin.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Atriplex schugnanica</i> Iljin.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Avena sativa</i> L.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Axyris hybrida</i> L.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Axyris prostrata</i> L.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Azadirachta indica</i> A.Juss.	Meliaceae	Dicot	Perennial	Tree	Jammu
<i>Barbarea vulgaris</i> R.Br. in W.T.Aiton	Brassicaceae	Dicot	Biennial	Herb	Jammu
<i>Barleria cristata</i> L.	Acanthaceae	Dicot	Perennial	Shrub	Jammu
<i>Bassia dasyphylla</i> (Fisch.& C.A. Mey.) Kuntze	Amaranthaceae	Dicot	Annual	Herb	Jammu
<i>Bassia prostrata</i> (L.) Beck.	Amaranthaceae	Dicot	Annual	Sub shrub	Jammu
<i>Bauhinia variegata</i> L.	Caesalpinaceae	Dicot	Perennial	Tree	Jammu
<i>Berberis lycium</i> Royle	Berberidaceae	Dicot	Perennial	Shrub	Jammu
<i>Berberis orthobotrys</i> Bienert ex Aitch.	Berberidaceae	Dicot	Annual	Shrub	Ladakh
<i>Berberis pachyacantha</i> Koehne	Berberidaceae	Dicot	Perennial	Shrub	Ladakh
<i>Berberis parkeriana</i> Schneid.	Berberidaceae	Dicot	Annual	Shrub	Ladakh
<i>Berberis ulicina</i> Hook.f. & Thomson.	Berberidaceae	Dicot	Perennial	Shrub	Ladakh
<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Beta vulgaris</i> L.	Leguminaceae	Dicot	Annual	Herb	Ladakh
<i>Bidens bipinnata</i> L.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Bidens biternata</i>	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Biebersteinia odorata</i> Stephan ex Fisch.	Biebersteiniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bistorta affinis</i> (D.Don) Greene	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Blumealacera</i> (Burm.f.) DC.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Blysmus compressus</i> (L.) Panz.ex Link	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Blysmus rufus</i> (Hudson) Link	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Boerhavia acutifolia</i> (Choisy) J.W.Moore	Nyctaginaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Bombax ceiba</i> L.	Bombaceae	Dicot	Perennial	Tree	Jammu
<i>Borreria affinis</i> DC.	Rubiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Borreria stricta</i> L.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Bothriochloa ischaemum</i> (L.) Keng	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Botrychium lunaria</i> (L.) Sw.	Ophioglossaceae	Pteridophytes	Perennial	Fern	Kashmir, Ladakh

<i>Bougainvillea spectabilis</i> Willd	Nyctaginaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Brachyactis pubescens</i> (DC.) Aitch. &C.B.Clarke.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Brachyactisroylei</i> (DC.) Wendelbo	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Brassica juncea</i> (L.)Czern.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica napus</i> L.	Brassicaceae	Dicot	Annual	Herb	J&K
<i>Brassica oleracea</i> L.var.botrytis L.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica oleracea</i> L.var.capitata L.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica oleracea</i> L.var.gemmiferaZenker.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica oleracea</i> L.var.gongyloides L.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica oleracea</i> L.var.sabauda L.	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Brassica rapa</i> L.subsp. campestris (L.) Clapham .	Brassicaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Bristorta vivipara</i> S. F. Gray.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bromuadectenatus</i> L.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Bromus confinis</i> Nees ex Steud.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Bromus danthoniae</i> Trin. in C.A. Mey.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Bromus gracillimus</i> Bunge	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Bromus japonicus</i> Thumb.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Bromus oxyodon</i> Schrenk.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Bromus pectinatus</i> Thunb.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Bromus tectorum</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Buglossoidestenuiflora</i>	<i>Boraginaceae</i>	<i>Dicot</i>	<i>Annual</i>	<i>Herb</i>	Kashmir, Ladakh
<i>Bukiniczia cabulica</i> (Boiss.) Lincz.	Plumbaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bupleurum jucundum</i> Kurz in Seem.var.cachemiricum	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bupleurum longicaule</i> Wall.ex DC.	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bupleurum marginatum</i> Wall. Ex Dc	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Bupleurum rupestre</i> Edgew.	Apiaceae	Dicot	Perennial	Herb	Ladakh

<i>Butea monosperma</i> Wild.	Leguminaceae	Dicot	Perennial	Tree	Ladakh
<i>Calamagrostis pulchella</i> Griseb.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Calamagrostis stoliczkae</i> Hook. f.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Calamagrostis holciformis</i> Jaub. & Spach	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Calamagrostis pseudopharmitis</i> Koeler	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Calendula arvensis</i> M. Bieb.	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Calendula officinalis</i> L.	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Callistephus chinensis</i> Nees	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Callitriche palustris</i> L.	Plantaginaceae	Dicot	Annual	Herb	Ladakh
<i>Calotropis procera</i> (Willd.) R. Br.	Apocynaceae.	Dicot	Perennial	Tree	Ladakh
<i>Caltha alba</i> Camb. in Jacquem.	Ranunculaceae	Dicot	Perennial	Herb	Ladakh
<i>Campanula alsinoides</i> Hook. f. & Thomson	Campanulaceae	Dicot	Perennial	Herb	Ladakh
<i>Campanula aristata</i> Wall.	Campanulaceae	Dicot	Perennial	Herb	Ladakh
<i>Campanula pallida</i> Wall.	Campanulaceae	Dicot	Perennial	Herb	Ladakh
<i>Cannabis sativa</i> L.	Cannabiaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Capparis sepiaria</i> L.	Capparaceae	Dicot	Annual	Shrub	J&K, Ladakh
<i>Capparis spinosa</i> L.	Capparaceae	Dicot	Perennial	Climber	J&K, Ladakh
<i>Capsella bursa pastoris</i> Medic.	Brassicaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Capsicum annuum</i> L.	Solanaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Caragana versicolor</i> Benth.	Leguminaceae	Dicot	Perennial	Shrub	Ladakh
<i>Cardamine macrophylla</i> Willd.	Brassicaceae	Dicot	Annual	Herb	Jammu
<i>Carduus edelbergii</i> Rech. f.	Asteraceae	Dicot	Biennial	Herb	Jammu
<i>Carduus edelbergii</i> Rech. f.	Poaceae	Monocot	Perennial	Herb	Jammu
<i>Carex atrofusca</i> Schkuhr.	Cyperaceae	Monocot	Perennial	Herb	Jammu
<i>Carex fedia</i> Nees	Cyperaceae	Monocot	Perennial	Herb	Jammu
<i>Carex microglochin</i> Wahlenb.	Cyperaceae	Monocot	Perennial	Herb	Jammu
<i>Carex montiseverestikuk.</i>	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Carex nivalis</i> Boott.	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh

<i>Carex orbicularis</i> Boot.	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Carex pseudofoetida</i> Kuk.	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Carex sagaensis</i> y.C.Yang	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Carex stenophylla</i> Wahlenb.	Cyperaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Apocynaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Carissa tomentosa</i> A.Rich.	Apocynaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Carpesium abrotanoides</i> L.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Carthamus oxycantha</i> M.Bieb.	Caesalpinaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Carum carvi</i> L.	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cassia fistula</i> L.	Leguminaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Cassia glauca</i> Lam.	Leguminaceae	Dicot	Annual	Tree	Kashmir, Ladakh
<i>Cassia occidentalis</i> L.	Leguminaceae	Dicot	Annual	Tree	Kashmir, Ladakh
<i>Cassia tora</i> L.B.Sm.&B.G.Schub.	Leguminaceae	Dicot	Annual	Tree	Kashmir, Ladakh
<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	Dicot	Perennial	Herb	Jammu
<i>Cenchrus flaccidus</i> (Griseb.) Morrone.	Poaceae	Monocot	Perennial	Herb	Jammu
<i>Cenchrus flaccidus</i> (Griseb.) Morrone.	Poaceae	Monocot	Perennial	Herb	Jammu
<i>Centaurea dealbata</i> Willd.	Asteraceae	Dicot	Biannual	Herb	J&K, Ladakh
<i>Centaurea depressa</i> M.Bieb.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Centaurea iberica</i> Trev. ex Spreng	Asteraceae	Dicot	Biennial	Herb	J&K, Ladakh
<i>Centaurium pulchellum</i> (Sw.) Druce subsp. <i>Meyeri</i>	Gentianaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Cerastiumcerastioides</i> Britt.	Caryophyllaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Cerastiumglomeratum</i> Thuill.	Caryophyllaceae	Dicot	Annual	Herb	Naturalized
<i>Ceratocephalus falcatus</i> Pers.	Ranunculaceae	Dicot	Annual	Herb	Naturalized
<i>Chamaerhodossabulosa</i> Bunge in Ledeb.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Chenopodium album</i> L.	Chenopodiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Chenopodium ambrosioides</i> L.	Amaranthaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Chenopodium foliolosum</i> Aschers	Chenopodiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Chenopodium foliosum</i> (Moench) Ascherson.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Chenopodium glaucum</i> L.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Chenopodium karoii</i> (Murr) Aellen	Amaranthaceae	Dicot	Annual	Herb	Ladakh
<i>Chenopodium murale</i> L.	Chenopodiaceae	Dicot	Perennial	Herb	Ladakh
<i>Chenopodium pamiricum</i> Iljin.	Amaranthaceae	Dicot	Annual	Herb	Ladakh
<i>Chesneya cristata</i> (Benth.) Ali.	Leguminaceae	Dicot	Perennial	Shrub	Ladakh
<i>Chesneya cuneata</i> (Benth.) Ali.	Leguminaceae	Dicot	Perennial	Shrub	Ladakh
<i>Chloris virgata</i> Sw.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Chondrilla graminea</i> M.Bieb.	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Chorisporea macropoda</i> Trautv.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Chorisporea sabulosa</i> Cambess.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Christolea crassifolia</i> Cambess.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Chrysanthemum abolinii</i> (Kovalevsk.) H.Ohashi&Yonek	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Chrysanthemum indicum</i> L.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cicer arietinum</i> L.	Leguminosae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Cicer microphyllum</i> Benth.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cirsium falconeri</i> Petrak	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cirsium wallichii</i> DC.	Asteraceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Clematis gouriana</i> Roxb. ex DC.	Ranunculaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Clematis grata</i> Wall.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Clematis graveolens</i> Lindl.	Ranunculaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Clematis ladakhiana</i> Grey-Wilson.	Ranunculaceae	Dicot	Perennial	Herb	Ladakh
<i>Clematis orientalis</i> L.	Ranunculaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Clematis tangutica</i> Korsh.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Clematis tibetica</i> Quézel.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Cleome gynandra</i> L.	Cleomaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cleome viscosa</i> L.	Cleomaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Clinopodium umbrosum</i> C. Koch	Lamiaceae	Dicot	Perennial	Herb	Jammu
<i>Clinopodium vulgare</i> L.	Lamiaceae	Dicot	Perennial	Herb	Jammu
<i>Coccinia grandis</i> Voigt.	Cucurbitaceae	Dicot	Perennial	Shrub	Jammu
<i>Codonopsis clematidea</i> (Schrenk) C.B. Clarke.	Campanulaceae	Dicot	Perennial	Herb	Jammu
<i>Colchicum luteum</i> Baker.	Colchicaceae	Monocot	Perennial	Herb	Jammu
<i>Colebrookea oppositifolia</i> Sm.	Commelinaceae	Monocot	Annual	Herb	Jammu
<i>Colutea nepalensis</i> Sims.	Leguminaceae	Dicot	Perennial	Herb	Jammu
<i>Comarum salesovianum</i> (Steph.) Ascherson & Graebner	Rosaceae	Dicot	Perennial	Herb	Jammu
<i>Comastoma azureum</i> (Bunge) Zuev.	Gentianaceae	Dicot	Perennial	Herb	Jammu
<i>Comastoma falcatum</i> (Turcz.) Toyokuni	Gentianaceae	Dicot	Annual	Herb	Jammu
<i>Comastoma pedunculatum</i> (Royle ex D. Don) Holub.	Gentianaceae	Dicot	Annual	Herb	Jammu
<i>Commelina africana</i> L.	Commelinaceae	Monocot	Perennial	Herb	Jammu
<i>Commelina benghalensis</i> L.	Commelinaceae	Monocot	Perennial	Herb	Jammu
<i>Conringia planisiliqua</i> Fisch. & C.A. Mey.	Brassicaceae	Dicot	Annual	Herb	Jammu
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Dicot	Perennial	Herb	Jammu
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Dicot	Perennial	Herb	Jammu
<i>Convolvulus glomeratus</i> Choisy	Convolvulaceae	Dicot	Perennial	Herb	Jammu
<i>Convolvulus vidis</i> L.	Convolvulaceae	Dicot	Perennial	Herb	Jammu
<i>Conyza borensis</i> (L.) Cronquist	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Conyza canadensis</i> (L.) Cronq	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Conyza somatrensis</i> Cronquist	Asteraceae	Dicot	Biennial	Herb	Jammu
<i>Cordia dichotoma</i> G. Forst.	Boraginaceae	Dicot	Perennial	Tree	Jammu
<i>Coriandrum sativum</i> L.	Apiaceae	Dicot	Annual	Herb	Jammu
<i>Corispermum ladakhianum</i> C. Grey- Wilson & B.M. Wadhwa	Chenopodiaceae	Dicot	Annual	Herb	Ladakh

<i>Corispermumpamiricum</i> Iljin	Chenopodaceae	Dicot	Perennial	Herb	Jammu
<i>Corispermumtibeticum</i> Iljin	Amaranthaceae	Dicot	Annual	Herb	Jammu
<i>Coronopusdidymus</i> Sm.	Brassicaceae	Dicot	Annual	Herb	Jammu
<i>Corthusabrotheri</i> Lipsky	Primulaceae	Dicot	Annual	Herb	Jammu
<i>Corydalis adiantifolia</i> Hook. f. & Thomson	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis clarkei</i> Prain	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis crassifolia</i> Royle	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis crassissima</i> Camb. in Jacquem.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis flabellata</i> Edgeworth.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis gortschakovii</i> Schrenk	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis govaniana</i> Wall.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis hendersonii</i> Hemsl.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis inopinata</i> Prain ex Fedde	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis meifolia</i> Wall.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Corydalis moorcroftiana</i> Wall. ex Hook.f. & Thomson.	Papaveraceae	Dicot	Perennial	Herb	Jammu
<i>Cosmos bipinatus</i> Cav.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Cotoneaster affinis</i> Lindley.	Rosaceae	Dicot	Perennial	Herb	Jammu
<i>Cotoneaster aitchisonii</i> C.K.Schneid.	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Cotoneaster nummularioides</i> Pojark.	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Cotulaanthemoides</i> L.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Cousiniathomsonii</i> C.B.Clarke.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Cozniadactylon</i> Pers.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Crataegus songarica</i> K. Koch	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Cremanthodium decaisnei</i> C.B.Clarke.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Cremanthodium ellisi</i> (Hook.f.) Kitam.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Crepidifolium tenuifolium</i> (Willd.) Sennikov.	Asteraceae	Dicot	Perennial	Herb	Jammu

<i>Crepiskashmirica</i> Babc.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Crepisminuta</i> Kitamura	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Crepismulticaulis</i> Ledeb.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Crepisnanaiforma</i> Babcock	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Crepis sancta</i> (L.)Babc.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Crepis sancta</i> Babc.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Crepiszanskarensis</i> ined.	Asteraceae	Dicot	Annual	Herb	Jammu
<i>Crotolariajuncea</i> L.	Boraginaceae	Dicot	Perennial	Herb	Jammu
<i>Crotolaria prostrate</i> Wild.	Boraginaceae	Dicot	Biannual	Herb	Jammu
<i>Crucihimalayahimalaica</i> (Edgew.) Al-Shehbaz, O'Kane&R.A.Price	Brassicaceae	Dicot	Biennial	Herb	Jammu
<i>Cucumis melo</i> L.	Cucurbitaceae	Dicot	Annual	Climber	Jammu
<i>Cucurbita pepo</i> L.	Cucurbitaceae	Dicot	Annual	Herb	Jammu
<i>Cuscutaplaniflora</i> Ten.	Convolvulaceae	Dicot	Annual	Parasitic	Jammu
<i>Cuscutareflexa</i> Roxb.	Convolvulaceae	Dicot	Perennial	Climber	Jammu
<i>Cyanoglossumlanceolatum</i> Forssk.	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cyanus depressus</i> (M.Bieb.) Soják.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cyathoclinepurpurea</i> (Buch.-Ham. ex D.Don) Kuntze	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cyclantherapedata</i> Schrad.	Cucurbitaceae	Dicot	Annual	Climber	Kashmir, Ladakh
<i>Cymbopogon iwarancusa</i>	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Cymbopogon pospischilii</i> (K.Schum.) C.E.Hubb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Cymbopogon Stracheyi</i> (Hook.f.) Raizada&S.K.Jain	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Cynanchum acutum</i> L.	Apocynaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Cynodondactylon</i> (L.) Pers.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Cynoglossumglochidiatum</i> Wall. ex Benth.	Boraginaceae	Dicot	Biennial	Herb	Ladakh
<i>Cynoglossumlanceolatum</i> Forssk	Boraginaceae	Dicot	Biennial	Herb	Ladakh

<i>Cynoglossumwallichii</i> L.	Boraginaceae	Dicot	Perennial	Herb	Ladakh
<i>Cynoglossumwallichii</i> var. <i>glochidiatum</i> (Wall. ex Benth.) Kazmi.	Boraginaceae	Dicot	Biennial	Herb	Ladakh
<i>Cyperus difformis</i> L.	Cyperaceae	Monocot	Perennial	Herb	Ladakh
<i>Cyperus niveus</i> Retz.	Cyperaceae	Monocot	Perennial	Herb	Ladakh
<i>Cyperus rotundifolia</i> L.	Cyperaceae	Monocot	Annual	Herb	Ladakh
<i>Cyperus rotundus</i> L.	Cyperaceae	Monocot	Perennial	Herb	Ladakh
<i>Cyperus squarrosus</i> L.	Cyperaceae	Monocot	Perennial	Herb	Ladakh
<i>Cystopterisdickieana</i> R.Sim	Cystopteridaceae	Pteridophytes	Perennial	Fern	Ladakh
<i>Cystopteris fragilis</i> (L.) Bernh.	Cystopteridaceae	Pteridophytes	Perennial	Fern	Ladakh
<i>Dactylis glomerata</i> L.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Dactylorhizahatagirea</i> (D.Don) Soó.	Orchidaceae	Monocot	Annual	Herb	Ladakh
<i>Dalbergia sissoo</i> Roxb.	Leguminaceae	Dicot	Annual	Tree	Ladakh
<i>Dasiphoradryadanthoides</i> Juz.	Rosaceae	Dicot	Perennial	Shrub	Ladakh
<i>Datura innoxia</i> Mill.	Solanaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Datura metal</i> L.	Solanaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Datura stramonium</i> L.	Solanaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Daucus carota</i> L.	Apiaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Deeringiaamaranthoides</i> Merr.	Amaranthaceae	Dicot	Perennial	Shrub	Ladakh
<i>Delphinium cashmerianum</i> Royle.	Ranunculaceae	Dicot	Perennial	Herb	Ladakh
<i>Dendrocalamusstrictus</i> Bl.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Dendrophthoe falcata</i> Ettings.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Descurainiasophia</i> Webb.	Brassicaceae	Dicot	annual	Herb	Ladakh
<i>Desideria linearis</i> (N.Busch) Al-Shehbaz	Brassicaceae	Dicot	Perennial	Herb	Ladakh
<i>Desideria pumila</i> (Kurz) Al-Shehbaz	Brassicaceae	Dicot	Perennial	Herb	Ladakh
<i>Desideria stewartii</i> (T.Anderson) Al-Shehbaz	Brassicaceae	Dicot	Perennial	Herb	Ladakh
<i>Desmodium elegans</i> DC.	Fabaceae	Dicot	Perennial	Shrub	Ladakh
<i>Desmodiumgangeticum</i> DC.	Leguminaceae	Dicot	Perennial	Herb	Ladakh

<i>Desmodiumheterocarpon</i> DC.	Leguminaceae	Dicot	Perennial	Herb	Ladakh
<i>Desmodiumtriflorum</i> DC.	Leguminaceae	Dicot	Annual	Herb	Ladakh
<i>Dianthus acantholimonoides</i> Schischk.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Dianthus anatolicus</i> Boiss.	Caryophyllaceae	Dicot	Annual	Herb	Ladakh
<i>Dianthus chinensis</i> L.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Dianthus harrissii</i> Rech. f.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Dichanthiumannulatum</i> (Forsk.) Stapf	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Diclipterabupleuroides</i> Nees	Acanthaceae	Dicot	Perennial	Herb	Ladakh
<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Dicot	Perennial	Herb	Ladakh
<i>Digitariacruciata</i> (Nees ex Steud.) <i>A. Camus</i>	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Digitariaischaemum</i> (Schreb.) Schreb. <i>ex Muhl.</i>	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Dilophia salsa</i> Thmososn.	Brassicaceae	Dicot	Annual	Herb	Ladakh
<i>Dioscoreadeltoidea</i> Wall. ex Kunth	Dioscoreaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Diospyros lotus</i> L.	Ebenaceae	Dicot	Annual	Tree	Kashmir, Ladakh
<i>Dipsacusfullonum</i> L.	Caprifoliaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Dodonoeaviscosa</i> (L.) Jacq.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Dontostemonglandulosus</i> O.E.Schmulz.	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Drabaaltaica</i> Bunge.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Drabacachemirica</i> Gand.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Draba glomerata</i> Royle.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Drabahimachallensis</i> Al Shehbaz.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Drabaoreades</i> Schrenk.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Drabopsis verna</i> C. Koch	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Dracocephalumheterophyllum</i> Benth.	Lamaiceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Dracocephalumstamineum</i> Kar. &Kir.	Lamaiceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Dryopteris barbiger</i> aO.Kze	Dryopteridaceae	Gymnosperm	Perennial	Herb	Kashmir, Ladakh
<i>Dysphania botrys</i> (L.) Mosyakin&Clemants.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Dysphania nepalensis</i> Mosyakin & Clemants	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Dysphania tibetica</i> Uotila	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Echinops cornigerus</i> DC.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Eclipta prostrata</i> L.	Sapindaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Ehretia laevis</i> Roxb.	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eichhornia crassipes</i> (Mart.) Solms.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Elaeagnus rhamnoides</i> (L.) A. Nelson.	Elaeagnaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Eleocharis mitracarpa</i> Steud.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Eleocharis oxylepis</i> (Meinsh.) B. Fedt.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Eleocharis palustris</i> (L.) R. Br.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elsholtzia densa</i> Benth.	Lamaiceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Elsholtzia eriostachya</i> Benth.	Lamaiceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Elymus canaliculatus</i> Tzvelev.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus cognetus</i> Cope	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus dahuricus</i> Turcz. ex Griseb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus dahuricus</i> Turcz. ex Griseb. in Ledeb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus dentatus</i> (Hook. f.) T.A. Cope	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus fedtschenkoi</i> Tzvelev	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus jacquemontii</i> Tzvelev	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus nutans</i> Griseb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus repens</i> (L.) Gould	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus schrenkianus</i> (Fisch. & C.A. Mey.) Tzvelev	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus schugnanicus</i> (Nevski) Tzvelev	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Elymus stewartii</i> (Melderis) T. A. Cope	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Ephedra gerrardiana</i> Wall. Ex Stapf.	Ephedraceae	Gymnosperm	Perennial	Shrub	Kashmir, Ladakh
<i>Ephedra intermedia</i> Schrenk & C.A. Mey.	Ephedraceae	Gymnosperm	Perennial	Shrub	Kashmir, Ladakh
<i>Ephedra regeliana</i> Florin.	Ephedraceae	Gymnosperm	Perennial	Shrub	Kashmir, Ladakh

<i>Epilobium angustifolium</i> L.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium latifolium</i> L.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium palustre</i> L.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium royleanum</i> Hausskn.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium semiamplexicaule</i> Chowdhery & Singh	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium</i> sp.	Onagraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Epilobium tetragonum</i> L.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epilobium tibetanum</i> Hausskn.	Onagraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Epipactis helleborine</i> (L.) Crantz.	Orchidaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Epipactis persica</i> (Soó) Nannfeld.	Orchidaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Equisetum arvense</i> L.	Equisetaceae	Pteridophyte	Perennial	Herb	Kashmir, Ladakh
<i>Equisetum debile</i> Roxb. ex Vauch.	Equisetaceae	Pteridophyte	Perennial	Herb	Kashmir, Ladakh
<i>Equisetum ramosissimum</i> Desf.	Equisetaceae	Pteridophyte	Perennial	Herb	Kashmir, Ladakh
<i>Eragrostis poaeoides</i> P. Beauv.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Eragrostis poaeoides</i> P. Beauv.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Eremostachys superba</i> Royle.	Lamiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Eremurushimalaicus</i>	Asphodelaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Erigeron multiradiatus</i> (Lindl. ex DC.) Benth. ex C.B. Clarke	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Erigeron poncinsii</i> (Franch.) Botsch.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium canum</i> (Benth.) Kitam	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium canum</i> var. <i>patens</i> (Decne.) Y.J. Nasir	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium fruticosum</i> Klotzsch.	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium hemisphaericum</i> W.T. Wang	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium minimum</i> (Brand) Hara	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium patens</i> Decne. in Jacquem.	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eritrichium spathulatum</i> (Benth. in Royle) C.B. Clarke	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Eritrichium villosum</i> (Ledeb.) Bunge.	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Erodium cicutarium</i> L'Herit. ex Ait	Geraniaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Erodium cicutarium</i> L'Herit. ex Ait	Geraniaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Eryngium billardieri</i> Del.	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Eucalyptus lanceolatus</i>	Myrtaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Euphorbia hispida</i> Boiss.	Euphorbiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Euphorbia indica</i> L.	Euphorbiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Euphorbia prostrata</i> var. <i>tebaticum</i>	Euphorbiaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Euphorbia tibetica</i> Boiss.	Euphorbiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Euphorbia vedia</i> L.	Euphorbiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Euphrasia pectinata</i> Ten.	Orobanchaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Faba vulgaris</i> Moench.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fagopyrum esculentum</i> Moench.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fagopyrum kashmirianum</i> A.H. Munshi.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fagopyrum sagittatum</i> .	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fagopyrum tataricum</i> (L.) Gaertn.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Ferula jaeschkeana</i>	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Festuca algae</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Festuca nitidula</i> Stapf.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Festuca rubra</i> L. subsp. <i>Rubra</i>	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Festuca tibetica</i> (Stapf) Alexeev	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Ficus auriculata</i> Lour.	Moraceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Ficus benbhalensis</i> L.	Moraceae	Dicot	Perennial	Tree	Kashmir, Ladakh

<i>Ficus hispida</i> L.	Moraceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Ficus palmata</i> Forssk.	Moraceae	Dicot	Annual	Tree	Kashmir, Ladakh
<i>Ficus racemosa</i> L.	Moraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Ficus religiosa</i> L.	Apiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Filago arvensis</i> L.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fimbristylis squarrosa</i> Vahl, Enum.	Cyperaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Foeniculum vulgare</i>	Fumariaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fragaria bucharica</i> Lindley	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Fragaria bucharica</i> Lindley.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Fragaria nubicola</i> Lindel. ex Lacaita	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Fumaria indica</i>	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Fumaria indica</i> (Hauskn.) Pugsley	Paperveraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gagealadakhensis</i> Levichev et Klimes.	Liliaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Gagealeosii</i> Ali et Levichev.	Liliaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium aparine</i> L.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium asperuloides</i> Edgew.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium boreale</i> L.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium palustre</i> L.	Rubiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Galium pauciflorum</i> Bunge	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium rotundifolium</i> L.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium serpylloides</i> Royle ex Hook.f.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium spurium</i> L.	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium tricornerutum</i> Dandy	Rubiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Galium verum</i> L.	Rubiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gentiana hugelii</i> Griseb. in DC.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana karelinii</i> Grisebach in DC.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana leucomelaena</i> Maxim. var. minutained.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Gentiana nubigena</i> Edgeworth.	Gentianaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gentiana paludosa</i> L.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana prostrata</i> Haenke in Jacquem.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana riparia</i> Kar. &Kir.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana squarrosa</i> Ledeb.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana stellatan</i> Turrill. var. <i>acuminata</i> (C.B. Clarke) T.N. Ho	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiana tianschanica</i> Rupr.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella arenaria</i> (Maxim.)	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella azurea</i> (Bunge) Holub	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella falconeri</i> L.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella maddenii</i> (C.B. Clarke) Airy Shaw	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella moorcroftiana</i> (Wall. ex G. Don) Airy Shaw in Hook. f.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella pygmaea</i> (Regel &Schmalh.) Harry Sm.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianella stoliczkai</i> (Kurz ex C.B. Clarke) Holub	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianopsis paludosa</i> (Munro ex Hook. f.) Ma	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentianopsis vvedenskyi</i> (Grossh.) V.V. Pissjauk.	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gentiniaburkillii</i> Harry sm.	Gentianaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Geranium himalayense</i> Klotzsch.	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Geranium nepalense</i> Sweet	Geraniaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Geranium pretense</i>	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Geranium pusillum</i> L.	Geraniaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Geranium regelii</i> Nevski.	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Geranium sibiricum</i>	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Geranium wallichianum</i> D. Don. ex Sweet	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Geumurbanum</i> L.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Glebionis coronaria</i> (L.) Cass. ex Spach.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Glebionis coronaria</i> L.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gloriosa superba</i> L	Colchiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gnaphalium leuteoalbum</i> L.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i> Kanis ex J. Palmer	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Gomphrena celosiodes</i> Mart.	Amaranthaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Gomphrena celosioides</i> Mart.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Grewia optiva</i> J.R. Drumm. ex Burret	Malvaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Grewia tenax</i> Fiori.	Malvaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Gypsophila sedifolia</i> Kurz.	Caryophyllaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Halerpestes lancifolia</i> (Bertoloni) Hand.-Mazz.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Halerpestes sarmentosa</i> Kom.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Halogeton arachnoideus</i> Moq.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Halogeton glomeratus</i> (M. Bieb.) Ledeb.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Haloxylothomsonii</i> Bunge ex Bois	Amaranthaceae	Dicot	Perennial	Sub shrub	Kashmir, Ladakh
<i>Hedera nepalensis</i> K. Koch	Araliaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Hedysarum tibeticum</i> (Benth.) B.H. Choi & H. Ohashi.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Helianthus annuus</i> L.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Hemerocallis fulva</i> var. <i>angustifolia</i> Baker.	Xanthorrhoeaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Heracleum lanatum</i> Michx.	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Heracleum pinnatum</i> C.B. Clarke	Apiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Herminium monorchis</i> (L.) R.Br.	Orchidaceae	Monocot	Perennial	Herb	Ladakh
<i>Heteropappos semiprostratus</i> Grierson.	Asteraceae	Dicot	Perennial	Herb	Ladakh

<i>Heteropogoncontortus</i> (L.) P.Beauv. ex Roem. &Schult.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Himalrandiatetrasperma</i> (Wall. ex Roxb.) T.Yamaz.	Rubiaceae	Dicot	Perennial	Shrub	Ladakh
<i>Hippolytiasenecionis</i> Tzvelev.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Hippophaerhamnoides</i> L.	Elaeagnaceae	Dicot	Perennial	Shrub	Ladakh
<i>Hippophaetibetana</i>	Elaeagnaceae	Dicot	Perennial	Shrub	Ladakh
<i>Hippuris vulgaris</i> L.	Plantaginaceae	Dicot	Annual	Herb	Ladakh
<i>Hordeum brevisubulatum</i> (Trin.) Link	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Hordeum murinum</i> L.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Hordeum vulgare</i> L.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Humulus lupulus</i> L.	Cannabaceae	Monocot	Annual	Climber	Ladakh
<i>Hyoscyamus niger</i> L.	Solanaceae	Dicot	Annual	Herb	Ladakh
<i>Hyoscyamus pusillus</i> L.	Solanaceae	Dicot	Perennial	Herb	Native
<i>Hypocoumleptocarpum</i> J. D. Hooker & Thomson.	Papaveraceae	Dicot	Annual	Herb	Native
<i>Hyptissuaveolens</i> (L.) Poit.	Lamiaceae	Dicot	Annual	Herb	Kashmir
<i>Iberis amara</i> L.	Brassicaceae	Dicot	Annual	Herb	Kashmir
<i>Impatiens balsamina</i> L.	Balsaminaceae	Dicot	Annual	Herb	Kashmir
<i>Impatiens brachycentra</i> Karelin&Kirilov.	Balsaminaceae	Dicot	Annual	Herb	Kashmir
<i>Impatiens glandulifera</i> Royle	Balsaminaceae	Dicot	Annual	Herb	Kashmir
<i>Impatiens thomsonii</i> J. D. Hooker.	Balsaminaceae	Dicot	Annual	Herb	Kashmir
<i>Indigofera cordifolia</i> Roth	Leguminaceae	Dicot	Perennial	Shrub	Kashmir
<i>Indigofera heriantha</i> L.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir
<i>Indigofera heterantha</i> Wall. ex Brandis	Fabaceae	Dicot	Perennial	Shrub	Kashmir
<i>Indigofera tinctoria</i> L.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir
<i>Inulagraidiflora</i> L.	Asteraceae	Dicot	Perennial	Herb	Kashmir
<i>Inulakoelzii</i> Dawar& Qaiser.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Inulaobtusifolia</i> A.Kerner.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Inularhizocephala</i> Schrenk.	Asteraceae	Dicot	Perennial	Herb	Ladakh

<i>Inularhizocephala</i> Schrenk.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Dicot	Perennial	Herb	Ladakh
<i>Ipomoea cairica</i> (L.) Sweet	Convolvulaceae	Dicot	Perennial	Herb	Jammu
<i>Ipomoea carnea</i> (Mart. Ex Choisy) Austin.	Convolvulaceae.	Dicot	Perennial	Climber	Jammu
<i>Ipomoea muricata</i> Jacq.	Convolvulaceae.	Dicot	Perennial	Climber	Jammu
<i>Ipomoea purpurea</i> (L.) Roth	Convolvulaceae.	Dicot	Perennial	Climber	Jammu
<i>Ipomoea purpurea</i> (L.)Roth.	Convolvulaceae	Dicot	Annual	Climber	Jammu
<i>Iris ensata</i> Thunb.	Iridaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Iris hookeriana</i> Foster.	Iridaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Iris lactea</i> Pall.	Iridaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Isodonrugosus</i> Codd	Lamiaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Isolepissetacea</i> (L.)R.Br.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Jasminum auriculatum</i> Vahl	Oleaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Jasminum humile</i> L.	Oleaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Juglans regia</i> L.	Juglandaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Juglans regia</i> L.	Juglandaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Juncus articulatus</i> L.	Juncaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Juncus himalensis</i> Klotzsch.	Juncaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Juncus membranaceus</i> Royle ex D. Don	Juncaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Juncus thomsonii</i> Buchenau	Juncaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Juncus turkestanicus</i> Krecz. &Gontsch.	Juncaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Juniperus semiglobosa</i> Regel.	Cupressaceae	Gymnosperm	Perennial	Tree	Kashmir, Ladakh
<i>Juniperus sibirica</i> Burgsd.	Cupressaceae	Gymnosperm	Perennial	Tree	Kashmir, Ladakh
<i>Juniperus squamata</i> Buch.-Ham.ex Lambert	Cupressaceae	Gymnosperm	Perennial	Tree	Kashmir, Ladakh
<i>Jurineaceratocarpa</i> Var. depressa C. B. Clarke	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Justicia adhatoda</i> L.	Acanthaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Kengiamutica</i> (Keng) Packer	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Kigeliaafricana</i> (Lam.) Benth.	Bignoniaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Knorringiapamirica</i> L.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Knorringiapamirica</i> (Korsh.)Tzvelev	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiacapillifolia</i> (Decne.)C.B.Clarke	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresia humilis</i> (C.A.Mey.)Serg.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresialaxa</i> Nees in Wight	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiamacrantha</i> Boeck.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiamyusoroides</i> Fiori &Paoletti subsp. <i>bistaminata</i> (W.Z.Di&M.J.Zhong)S.R.Zhang	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresianepalensis</i> (Nees) Kükenthal	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresianitens</i> Clarke	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiapygmaea</i> (C.B.Clarke) C.B.ClarkeinHook.f.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiaroyleana</i> .Boeak.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kobresiaschoenoides</i> Steud.	Cyperaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Kochia scoparia</i> (L.) Schrad.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Kochia stellaris</i> Moq.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Koeleria macrantha</i> (Ledeb.) Schult.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Koelpiniaislandica</i> L.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Koelpinia linearis</i> Pall.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Koelpiniavedis</i> Pall.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Koenigiadelicatula</i> (Meisn.)Hara	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Krascheninnikoviaceratoides</i> (L.) Gueldenst.	Amaranthaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Krascheninnikoviapungens</i> (Pazij) Podlech	Amaranthaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Kydiacalycina</i> Roxb.	Malvaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Lactucadissecta</i> D.Don	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lactucalessertiana</i> (Wall. ex DC.) Wall. ex C.B.Clarke.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Lactucaorientalis</i> (Boiss.) Boiss.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lactuca sativa</i> L.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lactucatararica</i> (L.) C.A.Mey.	Asteraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Ladakiellaklimesii</i> Al Shehbaz.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lagopsismarrubiastrum</i> (Stephan) Ikonn.-Gal.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lanceatibetica</i> Hook .F.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lanceatibetica</i> Hook .F.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lanneacoromandelica</i> Merr.	Anacardiaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Lantana camara</i> L.	Verbenaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Lathyrus sativus</i> L.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lens culinaris</i> Medik.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Leontopodium nanum</i> (Hook.f. & Thomson ex Hook.f. & Thomson) Hand.-Mazz.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Leontopodium ochroleucum</i> Beauverd.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Leontopodium pusillum</i> (Beauverd) Hand.-Mazz.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lepidium apetalum</i> Willd.	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lepidium capitatum</i> Hook.f .Thomson.	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lepidium latifolium</i> L.	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lepidium sativum</i> L.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Leptorhabdos parviflora</i> Benth.	Orobanchaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lepyrodiclisholosteoides</i> (C.A. Mey.) Fenzl ex Fisch. & C.A. Mey.	Caryophyllaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lespedeza cuneata</i> G. Don	Fabaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Lespedeza elegans</i> Camb	Fabaceae	Dicot	Perennial	Subshrub	Kashmir, Ladakh
<i>Leucaena leucocephala</i> (Lam.) de Wit	Leguminaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Leymus secalinus</i> (Georgi) Tzvelev	Geraniaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lindelofiaanchusoides</i> (Lindl.) Lehm.	Boraginaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Lindelofia stylosa</i> (Kar. & Kir.) Brand	Boraginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Linderbergia indica</i> Vatke.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Linum perenne</i> L.	Linaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Linum usitatissimum</i> L.	Linaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lithospermum arvense</i> L.	Boraginaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lloydia serotina</i> (L.) Rehb.	Liliaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Lobularia maritima</i> (L.) Desv.	Brassicaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lomatogonium brachyantherum</i> (C.B. Clarke) Fernald	Gentianaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Lomatogonium caeruleum</i> (Royle) Harry Sm. ex B. L. Burt	Gentianaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lomatogonium carinthiacum</i> (Wulfen) Reichenbach.	Gentianaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Lomatogonium thomsonii</i> (C.B. Clarke) Fernald	Gentianaceae	Dicot	Perennial	Herb	Ladakh
<i>Lonicera microphylla</i> Willd. ex Roem. & Schult.	Caprifoliaceae	Dicot	Perennial	Shrub	Ladakh
<i>Lonicera obovata</i> Royle ex Hook. f. & Thoms.	Caprifoliaceae	Dicot	Perennial	Shrub	Ladakh
<i>Lonicera semenovii</i> Regel.	Caprifoliaceae	Dicot	Perennial	Shrub	Ladakh
<i>Lonicera spinosa</i> (Decne.) Walp.	Caprifoliaceae	Dicot	Perennial	Shrub	Ladakh
<i>Lotus corniculatus</i> L.	Fabaceae	Dicot	Perennial	Herb	Ladakh
<i>Luffa acutangula</i> Roxb.	Cucurbitaceae	Dicot	Annual	Herb	Ladakh
<i>Lycium ruthenicum</i> Murray	Solanaceae	Dicot	Perennial	Shrub	Ladakh
<i>Lysimachia arvensis</i> (L.) U. Manns & Anderb.	Primulaceae	Dicot	Annual	Herb	Ladakh
<i>Lythrum hyssopifolia</i> L.	Lythraceae	Dicot	Annual	Herb	Ladakh
<i>Malcolmia africana</i> R. Br.	Brassicaceae	Dicot	Annual	Herb	Ladakh
<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	Euphorbiaceae	Dicot	Annual	Herb	Ladakh
<i>Malus domestica</i> Borkh.	Rosaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Malva neglecta</i> Wall.	Malvaceae	Dicot	Biennial	Herb	Kashmir, Ladakh

<i>Malva pamiroalaicalljin</i>	Malvaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Malva parviflora</i> L.	Malvaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Malvastrum coromandelium</i> (L.) Garcke	Malvaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Mangifera indica</i> L.	Anacardiaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Marmoritis rotundifolia</i> Benth. in Hooker	Lamaiceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Marrubium vulgare</i> L.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Matthiolorassanica</i> Bunge ex Boiss.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Mattiastrumhimalayense</i> (Klotzsch) Brand.	Boraginaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Mazuspumilus</i> (Burm.f.) Steenis	Phrymaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Meconopsis aculeata</i> Royle.	Papaveraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Medicago falcata</i> L.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Medicago lupulina</i> L.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Vicafaba</i> L	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Medicago polymorpha</i> L.	Fabaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Medicago sativa</i> L.	Fabaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Medicago falcate var.tradis</i> L.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Melia azedarach</i> L.	Meliaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Melica persica</i> Kunth.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Melica persica var. caspica</i> Griseb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Melilotus albus</i> Medik.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Melilotus officinalis</i> (L.) Pall.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Mentha longifolia</i> Benth. in Wall.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Menthatrilonia</i> L.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Mentha royleana</i> Wall. ex Benth.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Mentha spicata</i> L.	Lamiaceae	Dicot	Perennial	Herb	J&K
<i>Microgynoeciumtibeticum</i> Hook. f.	Amaranthaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Micromeriabiflora</i> (Buch.-Ham. ex D.Don) Benth.	Lamiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Microulatibetica</i> Benth. in Benth. & Hook. f.	Boraginaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Mimosa rubicaulis</i> Lam.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Minuartia foliosa</i> Majumdar .	Caryophyllaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Momordica charantia</i> L.	Cucurbitaceae	Dicot	Annual	Climber	Kashmir, Ladakh
<i>Morinacoulteriana</i> Royle.	Caprifoliaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Moringa oleifera</i> Lamk.	Moringaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Morus alba</i> L.	Moraceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Murrayakoenigii</i> Spreng.	Rutaceae	Dicot	Perennial	Tree	Ladakh
<i>Myosotis asiatica</i> (Vestergren) Schischk. & Sergienko.	Boraginaceae	Dicot	Perennial	Herb	Ladakh
<i>Myosotis micrantha</i> auct. non Pall. ex Lehm.	Boraginaceae	Dicot	Annual	Herb	Ladakh
<i>Myosotis sylvatica</i> Ehrh. ex Hoffm.	Boraginaceae	Dicot	Perennial	Herb	Ladakh
<i>Myriactis nepalensis</i> Less.	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Myricaria elegans</i> Royle.	Tamaricaceae	Dicot	Perennial	Shrub	Ladakh
<i>Myricaria germanica</i> (L.) Desv.	Tamaricaceae	Dicot	Perennial	Tree	Ladakh
<i>Nepeta coeruleascens</i> Maximowicz.	Lamiaceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta discolor</i> Benth.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta floccosa</i> Benth.	Lamiaceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta glutinosa</i> Benth.	Lamiaceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta gracilifera</i>	Lamiaceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta laevigata</i> (D. Don) Hand.-Mazz.	Lamiaceae	Dicot	Perennial	Herb	Ladakh
<i>Nepeta longibracteata</i> Benth.	Lamiaceae	Dicot	Annual	Herb	Ladakh
<i>Nepeta royleana</i> R.R. Stewart.	Lamiaceae	Dicot	Annual	Herb	Ladakh
<i>Nerium oleander</i> L.	Apocynaceae	Dicot	Annual	Tree	Ladakh
<i>Inula cappa</i> (Buch.-Ham. ex D. Don) DC.	Asteraceae	Dicot	perennial	Tree	Ladakh
<i>Ocimum americanum</i> L.	Lamiaceae	Dicot	Annual	Herb	Jammu
<i>Oenothera rosea</i> Ait.	Onagraceae	Dicot	Perennial	Herb	Jammu

<i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. &G.Don) Cif.	Oleaceae	Dicot	Annual	Tree	Jammu
<i>Onopordumacanthium</i> L.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Opuntia stricta</i> (Haw.) Haw. var. <i>stricta</i>	Cactaceae	Dicot	Perennial	Herb	Jammu
<i>Opuntia vulgaris</i> Mill.	Cactaceae	Dicot	Perennial	Herb	Jammu
<i>Orobanchecaesia</i> Reichb.	Orobanchaceae	Dicot	Annual	Herb	Jammu
<i>Orobanchecernua</i> Loefl.	Orobanchaceae	Dicot	Perennial	Herb	Jammu
<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	Dicot	Perennial	Tree	Jammu
<i>Oryzopsismunroi</i> Stapf	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Oxalis abercornensi</i> Knuth.	Oxalidaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Oxalis corniculata</i> L.	Oxalidaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Oxotrupisvardis</i> L.	Leguminaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Oxyriadigyna</i> (L.) Hill.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Oxytropiscachemeriana</i> Camb.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropischiliophylla</i> Royle ex Benth. in Royle	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropisdeflexa</i> (Pall.) DC.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropisdensa</i> Benth.ex Bunge	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropis glabra</i> DC.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropishumifusa</i> Kar. &Kir.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropishypoglottoides</i> Baker.	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropislapponica</i> (Wahlenb.)Gay	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropislehmannii</i> Bunge	Leguminaceae	Dicot	Perennial	shrub	Kashmir, Ladakh
<i>Oxytropismicrophylla</i> (Pall.) DC.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Oxytropispusilla</i> Bunge.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Oxytropistatarica</i> Baker.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Oxytropus pauciflora</i> Bung.	Leguminaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Papaver dubium</i> L.	Papaveraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Papaver robous</i> L.	Papaveraceae	Dicot	Perennial	Shrub	Kashmir, Ladakh

<i>Papaver nudicaule</i> L.	Papaveraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Papaver rhoeas</i> Linn.	Papaveraceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Papaver somniferum var. indicum</i> L.	Papaveraceae.	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Papaver somniferum</i> L.	Papaveraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Paraquilegiaanemonoides</i> (Willd.) Ulbr.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Parietarialusitanica</i> L.	Amaryllidaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Parnassialaxmannii</i> Pall. ex Schult.	Caryophyllaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Parnassiapusilla</i> Wall.	Parnassiaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Parrya nudicaulis</i> (L.)Boiss.	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Parthenium hysterophorus</i> L.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularisbicornuta</i> Klotzsch.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularisbicornuta</i> Klotzsch.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularisbrevifolia</i> D. Don	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularischeilanthifolia</i> Schrenksubsp. svenhedinii (Paulsen)P.C.Tsoong	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularislongiflora</i> Rudolph subsp.tubiformis (Klotzsch)Pennell	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularismollis</i> Wall.exBenth.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularisoederi</i> Vahl in Hornem.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularispuncatata</i> L.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularispycnantha</i> Boiss.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularis pyramidata</i> Royle ex Benth.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pedicularisrhinanthoides</i> Schrenk ex Fisch.&C.A.Mey.	Orobanchaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pegaeophytonscapiflorum</i> (Hook.f.& Thomson) Marq.& Shaw	Brassicaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Peganum harmala</i> L.	Nitrariaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Pennisetum glaucum</i> (L.) R.Br.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Pergulariadaemia</i> (Forssk.) Chiov.	Apocynaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Perovskiaabrotanoides</i> Kar.	Lamaiceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Persicaria amphibia</i> (L.)Gray	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Persicaria glacialis</i> (Meissn.)Hara	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Persicaria hydropiper</i> (L.)Delarbre	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Persicarialapathifolia</i> (L.) Delarbre.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Persicarianepalensis</i> (Meisn.) Miyabe.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Persicariaorientalis</i> (L.)Spach.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Pervoskiaabrotanoides</i> Kar.	Lamaiceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Phaseolus coccineus</i> L.	Leguminosae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Phaseolus vulgaris</i> L.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Phleum alpinum</i> L.	Poaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Monocot	Perennial	Tree	Kashmir, Ladakh
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Physochlainapraealta</i> (Decne.) Miers.	Solanaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Picris nuristanica</i> Bornm.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Picrorhizakurrooa</i> Royle ex Benth.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Pinus roxburghii</i> Sarg.	Pinaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Piptatherum gracile</i> Mez	Poaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Piptatherumlaterale</i> (Regel) Nevski.	Poaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Pisum sativum</i> L.	Leguminaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Plantago depressa</i> Willd.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago himalaica</i>	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago lanceolata</i> L.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plumbago lanceolata</i> L.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago lanceolate</i> var. <i>lactata</i> L.	Plantiginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago major</i> L.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago viulatra</i> L.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Plantago ovata</i> Forssk.	Plantaginaceae	Dicot	Perennial	Herb	Kashmir, Ladakh

<i>Platyclusorientalis</i> L.	Cupressaceae	Dicot	Perennial	Shrub	Kashmir, Ladakh
<i>Pleurospermum album</i> C.B. Clarke ex H. Wolff.	Apiaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Pleurospermum hookeri</i> C.B. Clarke in Hook. f. var. <i>thomsonii</i> C.B. Clarke	Apiaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Pleurospermum lindleyanum</i> (Klotzsch. & Garcke) B. Fedtsch.	Apiaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Pleurospermum stellatum</i> Benth.	Apiaceae	Dicot	Biennial	Herb	Kashmir, Ladakh
<i>Poa atunata</i> L.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa alpina</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa angustata</i> R.Br.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa angustifolia</i> L.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa afalta</i> L.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa bristat</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa annua</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa attenuata</i> Trin.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa bulbosa</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa calliopsis</i> Litw.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa falconeri</i> Hook. f.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa pectinatus</i> L.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa pratensis</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa pratensis</i> L. subsp. <i>Pratensis</i> .	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa sikkimensis</i> (Stapf) Bor.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Poa sterilis</i> M. Bieb.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa supina</i> Schrad.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa suruana</i> Hartm.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Poa tibetica</i> Munro ex Stapf in Hook. f.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Podophyllum hexandrum</i> DC.	Berberidaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Polygonatum multiflorum</i> All.,	Asparagaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Polygonum abbreviatum</i> Kom.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Polygonum alpestres</i> Beth.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Polygonum amplexicaule</i> D. Don	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Polygonum aviculare</i> L.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum cognatum</i> Meissn.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Polygonum convolvulus</i> L.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum hydropiper</i> L.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum kashmirianum</i>	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum lapathifolium</i> L.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum minus</i> Huds.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum molliaeforme</i> Boiss.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum paronychiodes</i> C. A. Mey.	Polygonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Polygonum rottboellioides</i> Jaub. & Spach.	Polygonaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Polypogon fugax</i> Ness ex Steud.	Poaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Polypogon monspeliensis</i> (L.) Desf.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Populus alba</i> L.	Salicaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Populus ciliata</i> Wall. ex Royle.	Salicaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Populus nigra</i> L.	Salicaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Populus pamirica</i> Kom.	Salicaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Populus pannonica</i> Kit. ex Besser.	Salicaceae	Dicot	Perennial	Tree	Kashmir, Ladakh
<i>Portulaca oleracea</i> L.	Portulacaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Potamogeton crispus</i> L.	Potamogetonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Potamogeton filiformis</i> Pers.	Potamogetonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Potamogeton nodosus</i> Poir.	Potamogetonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Potamogeton pamiricus</i> Baagoe.	Potamogetonaceae	Dicot	Annual	Herb	Kashmir, Ladakh
<i>Potamogeton perfoliatus</i> L.	Potamogetonaceae	Dicot	Annual	Herb	Kashmir, Ladakh

<i>Potentilla agrimonioides</i> M.Bibe	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Potentilla anserina</i> L.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Potentilla argrophylla</i> Wall.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Potentilla atosanguinea</i> Lodd.	Rosaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Potentilla biflora</i> Willd. ex Schlecht.var.biflora	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Potentilla eriocarpa</i> Wall.exLehm.	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Potentilla evestita</i> T. Wolf var. orthotrichaJ.Soják	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Potentilla exigua</i> Soják	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Potentilla gelida</i> C.A.Mey.subsp.borissii (Ovcz.&Kocz.)Sojak	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Potentilla grandiloba</i> M.Shah&C.C.Wilcock	Rosaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Prangospabularia</i> Lindl.	Apiaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula denticulata</i> Smith	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula elliptica</i> Royle	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula macrophylla</i> D.Don.	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula minutissima</i> Jacquem.exDuby.	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula nutans</i> Georgi	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Primula obtusifolia</i> Royle	Primulaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Prosopis juliflora</i> (Sw.) DC.	Leguminaceae	Dicot	Perennial	Tree	Kashmir , Ladakh
<i>Provencheriacerastioides</i> (L.) B.Boivin.	Caryophyllaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Prunella vulgaris</i> L.	Lamiaceae	Dicot	Annual	Herb	Kashmir ,

					Ladakh
<i>Prunus persica</i> (L.) Batsch.	Rosaceae	Dicot	Perennial	Tree	Kashmir , Ladakh
<i>Psephellusdealbatus</i> (Willd.) C. Koch	Asteraceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Pseudomertensia echioides</i> Riedl.	Boraginaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Psychrogetonandryaloides</i> DC.	Asteraceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Puccinellia distans</i> (Jacquem.) Parl.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Puccinellia hackeliana</i> (V.I. Kreczetowicz) V.I. Kreczetowicz ex Drobow	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Puccinellia himalaica</i> Tzvelev	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Puccinellia kashmiriana</i> Bor	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Puccinellia tenuiflora</i> (Griseb.) Scribner & Merr.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Pulsatilla wallichiana</i> (Royle) Ulbr.	Ranunculaceae	Dicot	Perennial	Herb	Ladakh
<i>Pyrus pashia</i> Buch, & Ham.	Rosaceae	Dicot	Perennial	Tree	Kashmir , Ladakh
<i>Ranunpulgellus</i> L.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus arvensis</i> L.	Ranunculaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Ranunculus bikramii</i> B.S.Aswal&B.N.Mehrotra	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus brotherusii</i> Freyn	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus chaerophyllos</i> L.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus glacialiformis</i> Hand.-Mazz.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus hirtellus</i> Royle	Ranunculaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Ranunculus laetus</i> Wall.exHk. f. and T.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir ,

					Ladakh
<i>Ranunculus laetus</i> Wall. ex Hook. f. & Thomson	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus lobatus</i> Jacquem. ex Camb.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus longicaulis</i> Ledeb. ex A. Spreng.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus munroanus</i> J.R. Drum.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus rubrocalyx</i> Regel ex Kom.	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Ranunculus songoricus</i> Schrenk	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Ranunculus tanguticus</i> (Maximowicz) Ovczinnikov	Ranunculaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Raphanus sativus</i> L.	Brassicaceae	Dicot	Biennial	Herb	Kashmir , Ladakh
<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Reinwardtia indica</i> Dumort.	Linaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Rhamnus prostata</i> Nav.	Rosaceae	Dicot	Perennial	Shrub	Ladakh
<i>Rheum spiciforme</i> Royle.	Polygonaceae	Dicot	Annual	Herb	Ladakh
<i>Rheum tibeticum</i> Maxim. ex Hook. f.	Polygonaceae	Dicot	Perennial	Herb	Ladakh
<i>Rheum webbianum</i> Royle.	Polygonaceae	Dicot	Perennial	Herb	Ladakh
<i>Rhodiola heterodonta</i> (Hook. f. & Thomson) Boriss.	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Rhodiola imbricata</i> Edgew.	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Rhodiola pamiroalaica</i> Boriss.	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Rhodiola tibetica</i> (Hook. f. & Thomson) S.H. Fu.	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Rhodiola wallichiana</i> (Hook.) S.H. Fu.	Crassulaceae	Dicot	Perennial	Herb	Ladakh

<i>Ribes orientale</i> Desf.	Grossulariaceae	Dicot	Perennial	shrub	Ladakh
<i>Richteriapyrethroides</i> Kar. & Kir.	Asteraceae	Dicot	Perennial	Herb	Jammu
<i>Ricinus communis</i> Linn.	Euphorbiaceae	Dicot	Perennial	Tree	Jammu
<i>Robiniapseudacacia</i> L.	Leguminaceae	Dicot	Perennial	Tree	Jammu
<i>Rocheliadisperma</i> (L. f.) C. Koch	Boraginaceae	Dicot	Perennial	Herb	Jammu
<i>Rochelialeiocarpa</i> Ledeb.	Boraginaceae	Dicot	Perennial	Herb	Jammu
<i>Rocheliapeduncularis</i> Boiss.	Boraginaceae	Dicot	Perennial	Herb	Jammu
<i>Rosa brunonii</i> Lindl.	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Rosa ecae</i> Aitch.	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Rosa macrophylla</i> Lindl.	Rosaceae	Dicot	Perennial	Shrub	Jammu
<i>Rosa multiflora</i> Thunb.	Rosaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Rosa webbiana</i> Wall. ex Royle	Rosaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Rostraria cristata</i> (Linn.) Tzvelev	Poaceae	Monocot	Annual	Herb	J&K, Ladakh
<i>Rosularia alpestris</i> (Kar. & Kir.) Boriss	Crassulaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rubia cordifolia</i> var. <i>cordifolia</i> L.	Rubiaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rubia cordifolia</i> L.	Rubiaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Rubia tinctorum</i> L.	Rubiaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rubus ellipticus</i> Sm.	Rosaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Rubus paniculatus</i> Sm.	Rosaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Rumex acetosella</i> L.	Polygonaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Rumex angulatus</i> Rech. f.	Polygonaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rumex dentatus</i> L.	Polygonaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rumex hastatus</i> D. Don	Polygonaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Rumex patientia</i> L.	Polygonaceae	Dicot	Perennial	Herb	Ladakh
<i>Saginasaginoides</i> (L.) Karsten	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Sagittaria sagittifolia</i> L.	Alismataceae	Monocot	Annual	Herb	Ladakh
<i>Salix caesia</i> Vill.	Salicaceae	Dicot	Perennial	Shrub	Ladakh

<i>Salix karelinii</i> L.	Salicaceae	Dicot	Perennial	Shrub	Ladakh
<i>Salix pycnostachya</i> Anderson.	salicaceae	Dicot	Perennial	Shrub	Ladakh
<i>Salix sericocarpa</i> Andersson	Salicaceae	Dicot	Perennial	Tree	Ladakh
<i>Salix viminalis</i> L.	Salicaceae	Dicot	Perennial	Tree	Kashmir , Ladakh
<i>Salix wilhelmsiana</i> M.Bieb.	Salicaceae	Dicot	Perennial	Shrub	Kashmir , Ladakh
<i>Salsola jacquamontii</i> Moq.	Amaranthaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Salsola kali</i> subsp. <i>tragus</i> (L.) Čelak.	Amaranthaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Salvia absconditiflora</i> Greuter & Burdet	Lamiaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Salvia acuminata</i> Ruiz & Pav.	Lamiaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Salvia canariensis</i> L.	Lamiaceae	Dicot	Annual	Herb	Kashmir , Ladakh
<i>Salvia mocroftiana</i> Wall. ex Benth.	Lamiaceae	Dicot	Perennial	Herb	Kashmir , Ladakh
<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	Dicot	Perennial	Herb	Ladakh
<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea albescens</i> (DC.) Schulz-Bip.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea bracteata</i> Decne. in Jacquem.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea candolleana</i> (Wall. ex DC.) C.B. Clarke	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea depsangensis</i> Pamp.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea elliptica</i> C.B. Clarke ex Hook.f.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea falconeri</i> Hook.f.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea glacialis</i> Herder.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea glanduligera</i> Sch.Bip. ex Hook.f.	Asteraceae	Dicot	Perennial	Herb	Ladakh

<i>Saussureagnaphalodes</i> (Royle) Schulz-Bip.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussureagossypiflora</i> D.Don	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussureainversa</i> Raab-Straube.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussureajacea</i> (Klotzsch) C.B.Clarke.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurealeontodontoides</i> (DC.) Sch.Bip.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saussurea medusa</i> Maxim.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga cernua</i> L.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga flagellaris</i> Willd. ex Sternb. subsp. <i>crassiflagellata</i> Hult.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga jacquemontiana</i> Decne. in Jacquem.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga lychnitis</i> Hook.f. & Thomson	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga meeboldii</i> Engler &Irm.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga microviridis</i> Hara in Ohashi	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga nanella</i> Engl. &Irmscher	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga oppositifolia</i> L.subsp. <i>asiatica</i> (v.Hayek) Engl. &Irm.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga prorepens</i> Fisch.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga pulvinaria</i> Harry Sm.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga sibirica</i> L.	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Saxifraga sinomontana</i> J.T.Pan	Saxifragaceae	Dicot	Perennial	Herb	Ladakh
<i>Scandix pecten-veneris</i> L.	Apiaceae	Dicot	Annual	Herb	Ladakh
<i>Scorzonera virgata</i> DC.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Scrophularia dentata</i> Royle ex Benth.	Scrophulariaceae	Dicot	Annual	Herb	Ladakh
<i>Scrophulariakoelzii</i> Pennel.	Scrophulariaceae	Dicot	Perennial	Herb	Ladakh
<i>Sedum ewersii</i> Ledeb.	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Sedum oreades</i> (Decne.) Raymond-Hamet .	Crassulaceae	Dicot	Perennial	Herb	Ladakh
<i>Senecio krascheninnikovii</i> Schischk.	Asteraceae	Dicot	Perennial	Herb	Ladakh

<i>Senna occidentalis</i> (L.) Link	Leguminaceae	Dicot	Perennial	Herb	Ladakh
<i>Senna tora</i> (L.) Roxb.	Leguminaceae	Dicot	Perennial	Herb	Ladakh
<i>Seseli mucronatum</i> (Schrenk) Pimenov&Sdobnina.	Apiaceae	Dicot	Perennial	Herb	Ladakh
<i>Setariaglauca</i> P. Beauv.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Setariaviridis</i> P. Beauv.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Sida spinosa</i> L.	Malvaceae	Dicot	Perennial	Shrub	Ladakh
<i>Siegesbeckiaorientalis</i> L.	Asteraceae	Dicot	Annual	Herb	Ladakh
<i>Silene caespitella</i> F.N. Williams.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene conoidea</i> L.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene gonosperma</i> (Rupr.) Bocquet.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene graminifolia</i> Otth	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene himalayensis</i> (Rohrb.) Majumdar.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene moorcroftiana</i> Wall.exBenth. in Royle.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene nepalensis</i> Majumdar.	Caryophyllaceae	Dicot	Perennial	Herb	Ladakh
<i>Silene rechingeri</i> Bocq.	Caryophyllaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Silene vulgaris</i> Garcke	Caryophyllaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Sisymbriumbrassiciforme</i> O.E.Schulz.	Brassicaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sisymbriumloeselii</i> Linn.	Brassicaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sisymbrium officinale</i> Scoop.	Brassicaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sium medium</i> Fische.	Apiaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Solanum lycopersicum</i> L.	Solanaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Solanum melongena</i> L.	Solanaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Solidago virgaurea</i> L.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sonchus arvensis</i> L.	Asteraceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sonchus oleraceus</i> L.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Sonchus wightianus</i> DC.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh

<i>Sorbaria tomentosa</i> (Lindley) Rehder.	Rosaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Sorghum halepense</i> Pers.	Poaceae	Monocot	Perennial	Herb	J&K, Ladakh
<i>Spinacia oleracea</i> L.	Amaranthaceae	Dicot	Biennial	Herb	J&K, Ladakh
<i>Stachys melissifolia</i> Benth.	Lamiaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Stachys tibetica</i> Vatke.	Lamiaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Stellaria decumbens</i> Edgew.	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria depressa</i> Em. Schmid	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria irrigua</i> Bunge	Caryophyllaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Stellaria media</i> Cyr.	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria monosperma</i> Buch.Ham.exD.Don.	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria pseudoalsine</i> Lazkov&Klimeš	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria schistosa</i> Lazkov&Klimeš	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria soongorica</i> Roshev.	Caryophyllaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Stellaria tibetica</i> Kurz.	Caryophyllaceae	Dicot	Annual	Herb	Ladakh
<i>Stipa brandisii</i> Mez	Poaceae	Dicot	Annual	Herb	Ladakh
<i>Stipa breviflora</i> Grisebac.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa capillata</i> L.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa caucasica</i> Schmalh.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa concinna</i> Hook. f.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa himalaica</i> Rozhev. in Bot. Mater	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa pennata</i> L. subsp. kirghisoru	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa purpurea</i> Griseb.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa regeliana</i> Hackel	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa roborovskiyi</i> Roshev.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Stipa sibirica</i> Lamk.	Poaceae	Monocot	Perennial	Herb	Ladakh
<i>Stipa splendens</i> Trin. in Spreng.	Poaceae	Monocot	Annual	Herb	Ladakh, Kashmir
<i>Stipa subsessiliflora</i> (Rupr.) Rozhev. in Fedtsch.	Poaceae	Monocot	Annual	Herb	Ladakh, Kashmir

<i>Suaedaolufsenii</i> Paulsen	Amaranthaceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Swertia petiolata</i> Royle ex D. Don	Gentianaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Swertia thomsonii</i> C.B. Clarke in Hooker. f.	Gentianaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Syzygiumcumini</i> (L.) Skeels	Myrtaceae	Dicot	Perennial	Tree	Ladakh, Kashmir
<i>Tagetes erecta</i> L.	Asteraceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Tagetes patula</i> L.	Asteraceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Tanacetum stoliczkae</i> (C.B.Clarke) R.Khan	Asteraceae	Dicot	Perennial	Sub shrub	Ladakh, Kashmir
<i>Taraxacum offinaile</i> L.	Asteraceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Terminalia chebula</i> Retz.	Combretaceae	Dicot	Perennial	Tree	Ladakh, Kashmir
<i>Thalictrum alpinum</i> L.	Ranunculaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Thalictrum cultratum</i> Wallich	Ranunculaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Thalictrum platycarpum</i> Hook.f. & Thomson	Ranunculaceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Thermopsisinflata</i> Cambess.	Gentianaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Thlaspiarvense</i> Linn.	Brassicaceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Thlaspicochleariforme</i> DC.	Brassicaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Thylacospermumcaespitosum</i> (Camb.)Sc hischk.	Caryophyllaceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Thymus linearis</i> Benth.	Lamiaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Thymus linearis</i> Benth.	Lamiaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Tinospora sinensis</i> (Lour.) Merr	Menispermaceae	Dicot	Perennial	Climber	Ladakh, Kashmir
<i>Toona ciliata</i> M.Roem.	Meliaceae	Dicot	Perennial	Tree	Ladakh, Kashmir
<i>Torilis japonica</i> (Houtt.) DC.	Apiaceae	Dicot	Annual	Herb	Ladakh, Kashmir
<i>Tragopogon gracilis</i> D.Don	Asteraceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Tragopogon orientalis</i> L.	Asteraceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Trichodesma indicum</i> (L.) Lehm	Boraginaceae	Dicot	Perennial	Herb	Ladakh, Kashmir
<i>Trisetum spicatum</i> (L.) K.Richt.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh

<i>Triticum aestivum</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir, Ladakh
<i>Tulipa stellata</i> Hk.	Liliaceae	Monocot	Perennial	Herb	Kashmir, Ladakh
<i>Urineaceratocarpa</i> (Dcne.) Benth. &Hook.f.	Asteraceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Urtica dioica</i> L.	Urticaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Urtica hyperborea</i> L,	Urticaceae	Dicot	Perennial	Herb	Kashmir, Ladakh
<i>Verbascum</i> sp.	Scrophulariaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Verbascum thapsus</i> DC.	Scrophulariaceae	Dicot	Biennial	Herb	J&K, Ladakh
<i>Verbena officinalis</i> L.	Verbenaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Veronica agrestis</i> L.	Scrophulariaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Veronica beccabunga</i> L.	Plantaginaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Veronica beccabunga</i> L.	Scrophulariaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Veronica biloba</i> L.	Plantaginaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Veronica minima</i> K. Koch	Scrophulariaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Veronica persica</i> Poir.	Scrophulariaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Viburnum cotinifolium</i> D. Don	Caprifoliaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Viburnum grandiflorum</i> Wall. ex DC.	Caprifoliaceae	Dicot	Perennial	Shrub	J&K, Ladakh
<i>Vicia angustifolia</i> L.	Fabaceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Vicia faba</i> L.	Leguminaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Viola kunawurensis</i> Royle	Violaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Viola odorata</i> L.	Violaceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Vitex negundo</i> L.	Lamiaceae	Dicot	Perennial	Tree	J&K, Ladakh
<i>Vitis vinifera</i> L.	Vitaceae	Dicot	Perennial	Climber	Jammu
<i>Vulpia myuros</i> Gmel.	Poaceae	Monocot	Annual	Herb	Ladakh
<i>Waldheimia nivea</i> (Hook.f. & Thomson ex C.B.Clarke) Regel.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Waldheimia tomentosa</i> (Decne.) Regel.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Waldheimiatriidactylites</i> Kar. &Kir.	Asteraceae	Dicot	Perennial	Herb	Ladakh
<i>Waldheimiavestita</i> (Hook.f. & Thomson ex C.B.Clarke) Pamp.	Asteraceae	Dicot	Perennial	Herb	J&K, Ladakh

<i>Xanthium spinosum</i> L.	Asteraceae	Dicot	Perennial	Herb	J&K, Ladakh
<i>Xanthium strumarium</i> L.	Asteraceae	Dicot	Annual	Herb	J&K, Ladakh
<i>Zea mays</i> L.	Poaceae	Monocot	Annual	Herb	Kashmir

Table 2: Number of genera and species belonging to different families

Family name	No. of Species	No. of Genera
Asteraceae	215	180
Poaceae	116	84
Leguminaceae	95	71
Brassicaceae	78	45
Rosaceae	56	34
Ranunculaceae	84	56
Amaranthaceae	41	25
Gentianaceae	32	13
Caryophyllaceae	31	14
Polygonaceae	33	11
Boraginaceae	26	13
Cyperaceae	25	8
Lamiaceae	19	11
Papaveraceae	17	4
Apiaceae	16	15
Orobanchaceae	15	5
Plantaginaceae	13	7
Saxifragaceae	13	2

Salicaceae	11	2
Crassulaceae	10	2
Primulaceae	9	3
Rubiaceae	8	2
Onagraceae	7	1
Solanaceae	8	3
Caprifoliaceae	6	3
Alliaceae	6	1
Geraniaceae	5	3
Juncaceae	5	1
Potamogetonaceae	5	1
Berberidaceae	4	1
Campanulaceae	4	3
Cupressaceae	4	2
Orchidaceae	4	4
Balsaminaceae	3	1
Convolvulaceae	3	2
Elaeagnaceae	3	1
Ephedraceae	3	1
Equisetaceae	3	1
Liliaceae	3	3
Malvaceae	3	1
Scrophulariaceae	3	2
Chenopodaceae	2	1
Cucurbitaceae	2	2
Cystopteridaceae	2	1
Euphorbiaceae	2	1
Iridaceae	2	1

Juncaginaceae	2	1
Linaceae	2	1
Plumbaginaceae	2	2
Tamaricaceae	2	1
Urticaceae	2	1
Adoxaceae	1	1
Amaryllidaceae	1	1
Apocynaceae	1	1
Asphodelaceae	1	1
Biebersteiniaceae	1	1
Cannabaceae	1	1
Capparaceae	1	1
Colchicaceae	1	1
Grossulariaceae	1	1
Juglandaceae	1	1
Moraceae	1	1
Nitrariaceae	1	1
Ophioglossaceae	1	1
Oxalidaceae	1	1
Parnassiaceae	1	1
Portulacaceae	1	1
Violaceae	1	1
Vitaceae	1	1
Xanthorrhoeaceae	1	1
Zygophyllaceae	1	1
Total	1085	674

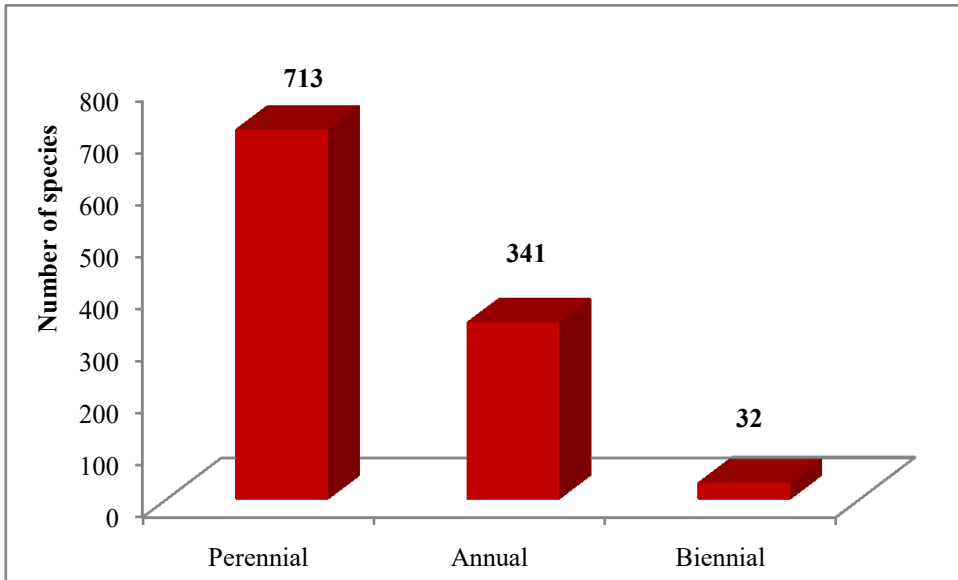


Fig.3: Number of species belonging to various life span categories

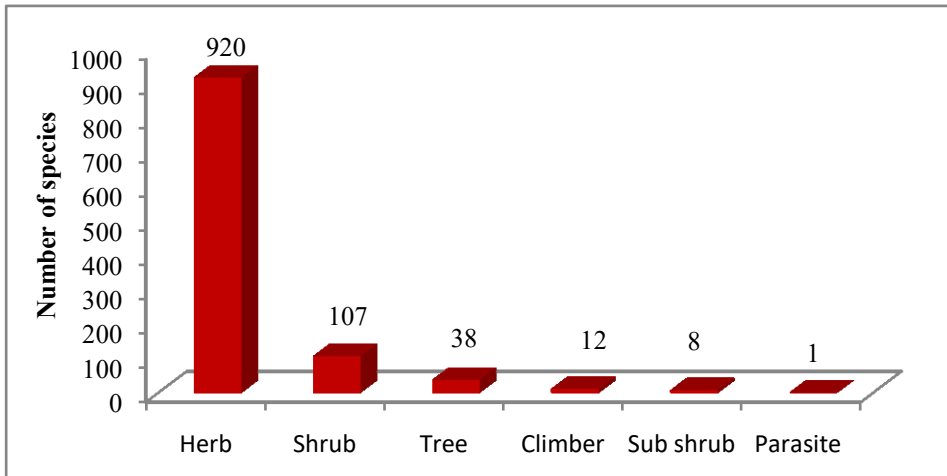


Fig.4: Number of species belonging to various growth forms

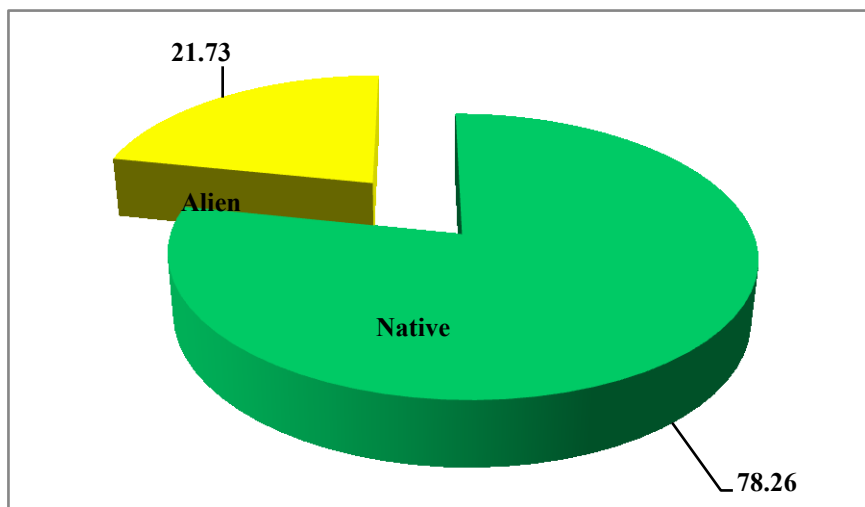


Fig. 5: Percentage of native and alien plant species

(1) Floristic diversity of Ladakh region of Trans-Himalaya

In the present study 807 plant species have been collected from Ladakh till date (Anexure III). These plant species belong to 324 genera in 71 families (Table 3). Of these 66 families belong to angiosperms (55 dicot and 11 monocot families), 3 to pteridophytes and 2 to gymnosperms (Table 3). Amongst these species, 646 species are dicots and 148 species are monocot; 7 species belong to gymnosperms and 6 species to pteridophytes (Fig.6). The first 5 largest families include: Asteraceae (105 species), Poaceae (95 species), Leguminaceae (49 species) Brassicaceae (43 species), Rosaceae (42 species) and Ranunculaceae (39 species) (Fig.7).

It has been observed in the present study that 720 species are herbs, 62 shrubs, and 16 trees. The percentage composition of these life forms is given in Fig. 8. Majority of the plant species are perennial (548 species) followed by annuals (238 species) and biannuals (21 species) (Fig.9).

Of the 807 plant species recorded 718 species are native and 89 are Alien. Amongst the alien species 49 species are invasive, 21 species are casual and 19 species are naturalized. The proportion of cultivated, naturalized and native species is depicted in Fig. 10. The percentage of invasive and non-invasive species among the naturalized species is depicted in Fig. 11.

Table 3: Number of genera and species belonging to different families

Family name	No. of species	No. of genera
Asteraceae	105	53
Poaceae	95	31
Leguminaceae	49	20
Brassicaceae	43	24
Rosaceae	42	11
Ranunculaceae	39	12
Amaranthaceae	34	14
Gentianaceae	32	6
Caryophyllaceae	31	14
Polygonaceae	33	11

Boraginaceae	26	13
Cyperaceae	25	5
Lamiaceae	19	9
Papaveraceae	17	4
Apiaceae	16	10
Orobanchaceae	15	4
Plantaginaceae	13	5
Saxifragaceae	13	2
Salicaceae	11	2
Crassulaceae	10	2
Primulaceae	9	3
Rubiaceae	8	2
Onagraceae	7	1
Solanaceae	8	3
Caprifoliaceae	6	3
Alliaceae	6	1
Geraniaceae	5	3
Juncaceae	5	1
Potamogetonaceae	5	1
Berberidaceae	4	1
Campanulaceae	4	3
Cupressaceae	4	2
Orchidaceae	4	4
Balsaminaceae	3	1
Convolvulaceae	3	2
Elaeagnaceae	3	1
Ephedraceae	3	1
Equisetaceae	3	1

Liliaceae	3	3
Malvaceae	3	1
Scrophulariaceae	3	2
Chenopodaceae	2	1
Cucurbitaceae	2	2
Cystopteridaceae	2	1
Euphorbiaceae	2	1
Iridaceae	2	1
Juncaginaceae	2	1
Linaceae	2	1
Plumbaginaceae	2	2
Tamaricaceae	2	1
Urticaceae	2	1
Adoxaceae	1	1
Amaryllidaceae	1	1
Apocynaceae	1	1
Asphodelaceae	1	1
Biebersteiniaceae	1	1
Cannabaceae	1	1
Capparaceae	1	1
Colchicaceae	1	1
Grossulariaceae	1	1
Juglandaceae	1	1
Moraceae	1	1
Nitrariaceae	1	1
Ophioglossaceae	1	1
Oxalidaceae	1	1
Parnassiaceae	1	1

Portulacaceae	1	1
Violaceae	1	1
Vitaceae	1	1
Xanthorrhoeaceae	1	1
Zygophyllaceae	1	1
Total	807	324

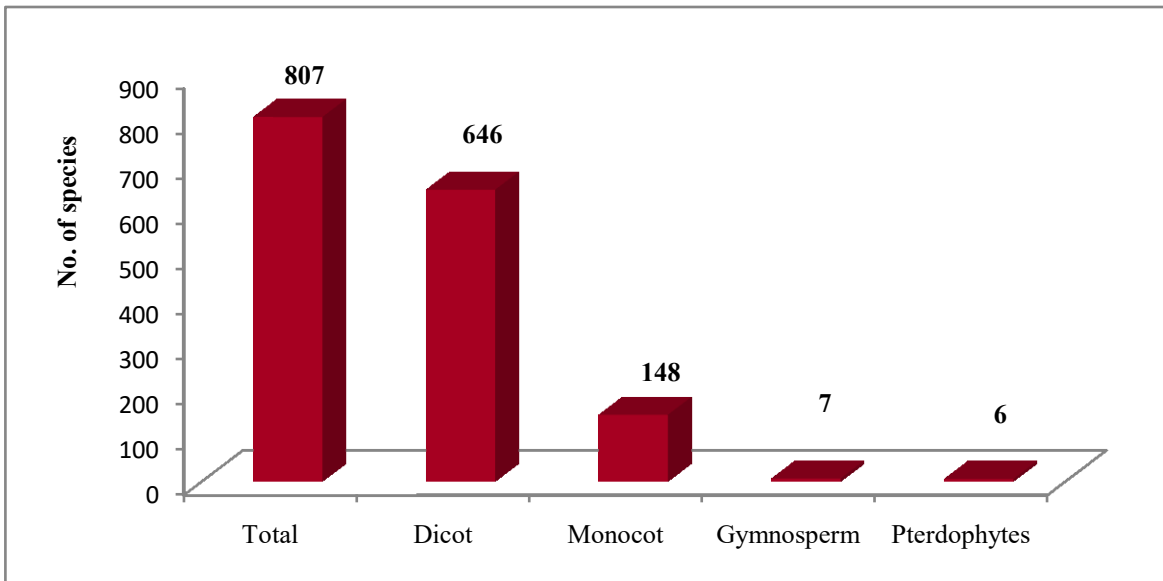


Fig.6: Number of species belonging to various taxonomic groups

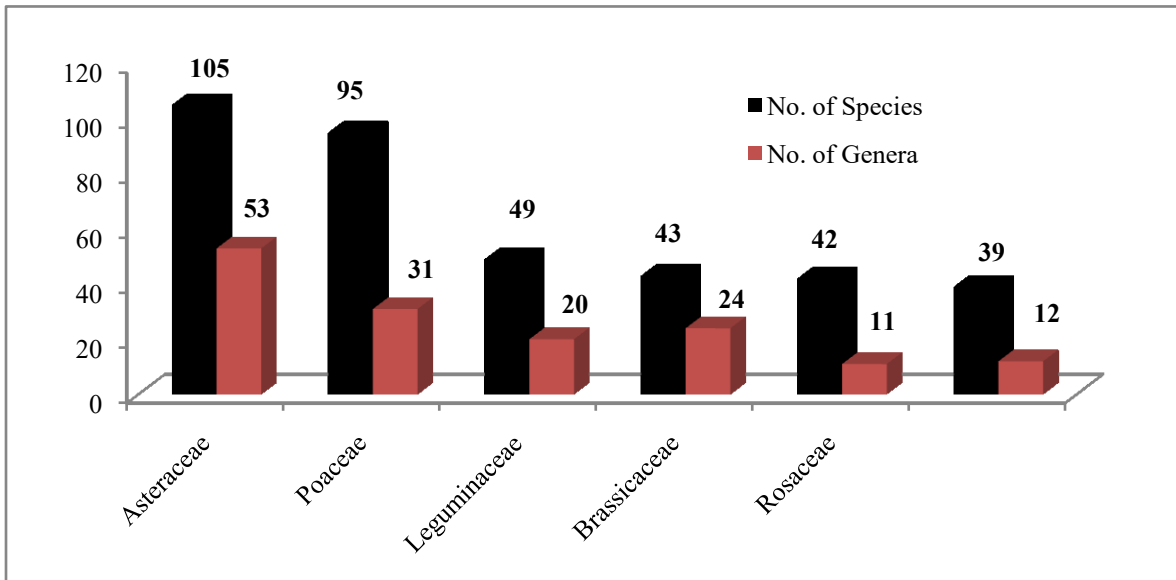


Fig. 7: Five largest families with more than ten species

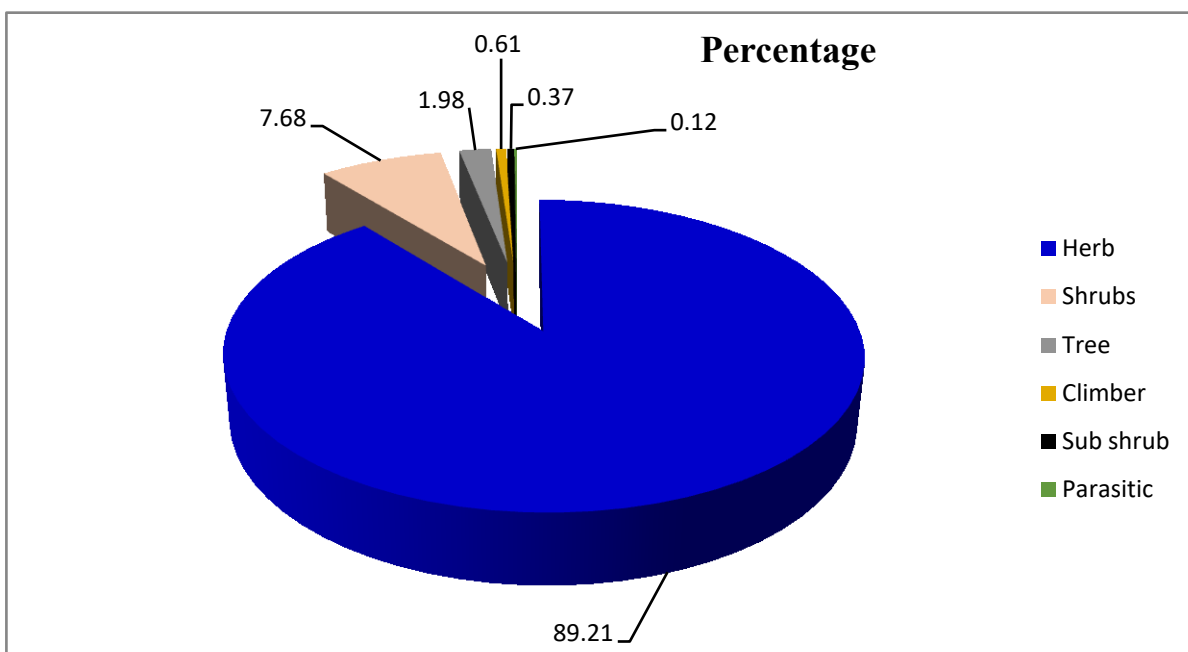


Fig.8: Percentage of various growth forms of the recorded plant species

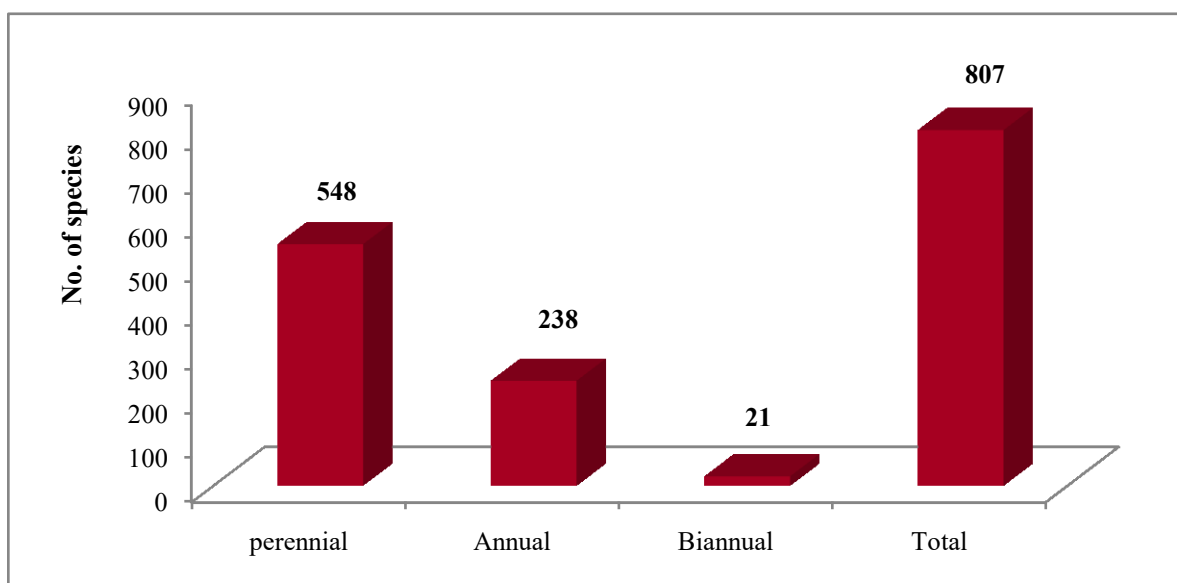


Fig.9: Number of plant species belonging to different life span categories

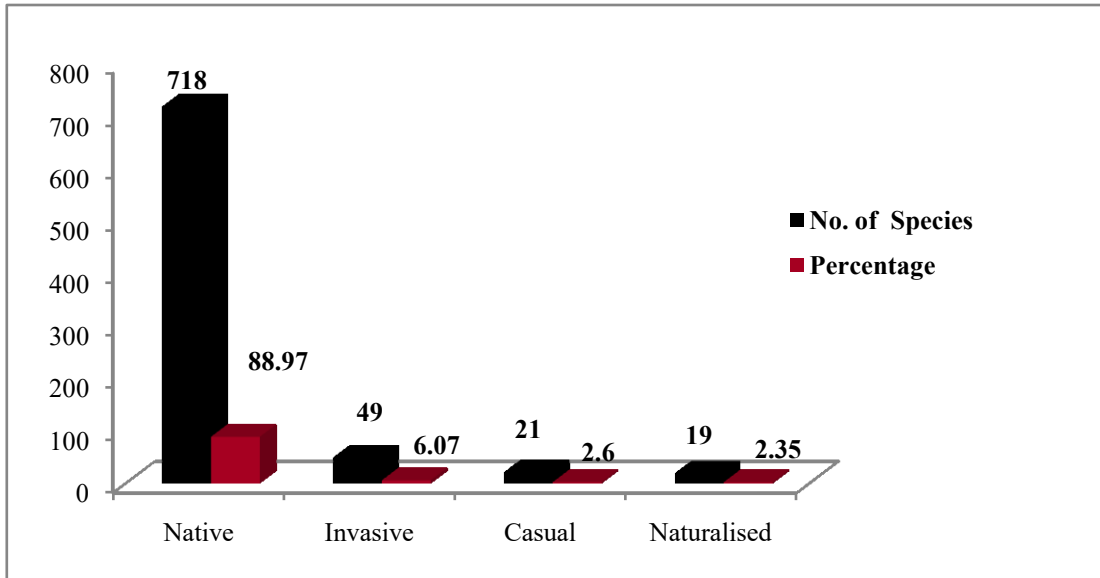


Fig.10: Proportion of native, invasive, casual and naturalized species

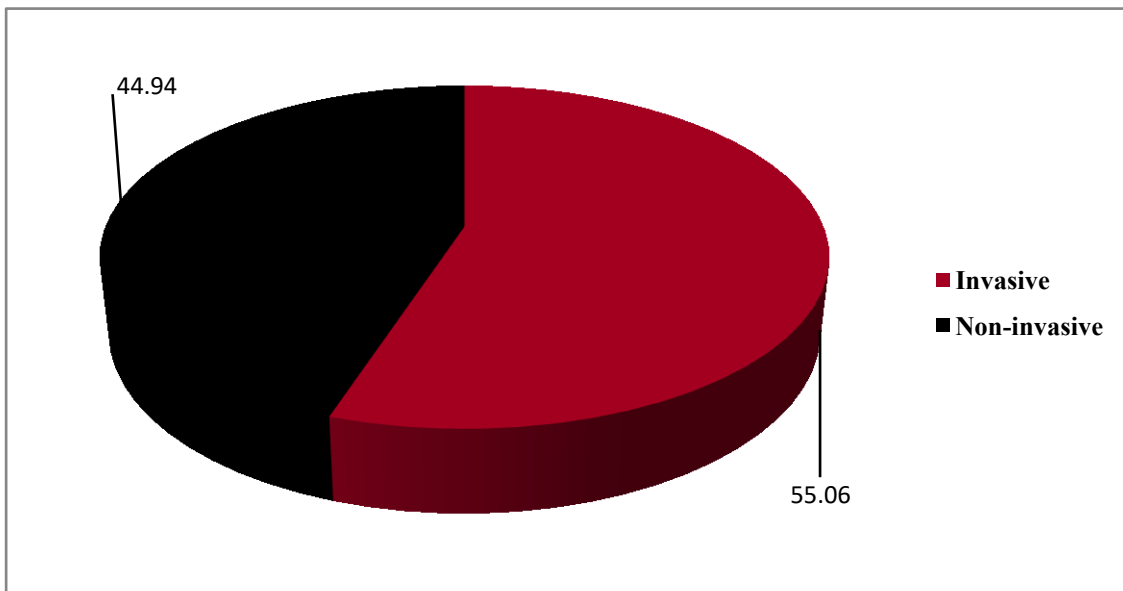


Fig. 11: Percentage of invasive and non- invasive species among the naturalized flora

(2) Floristic diversity of Kashmir

In the present study 268 plant species have been collected from Kashmir till date (annexure ii-a). These plant species belong to 176 genera in 57 families (Table 4). Of these 57 families 45 are dicots, 9 families are monocots and one each of gymnosperms and pteridophytes (Table 4). Amongst the recorded species, 217 species are dicots and 49 species are monocot, 3 gymnosperms and 1 species to pteridophytes (Fig.12). The first 5 largest families include: Asteraceae (39 species), Poaceae (33 species), Rosaceae (15 species) Polygonaceae (14 species) and Brassicaceae (13 species) (Fig.13).

It has been observed in the present study that 239 species are herbs, 19 shrubs, and 7 trees (Fig. 14). Majority of the plant species are perennial (149 species) followed by annuals 104 species) and biannuals (17 species).The percentage composition of the life span categories is given in Fig.15.

Of the 268 plant species recorded 95 species are native and 173 are Alien. The percentage of native and alien species is depicted in Fig.16.

Table 4: Number of genera and species belonging to different families

Family	Genera	Species
Asteraceae	29	39
Poaceae	26	33
Rosaceae	7	15
Polygonaceae	5	14
Brassicaceae	9	13
Leguminaceae	10	13
Amaranthaceae	5	11
Lamiaceae	6	9
Ranunculaceae	4	9
Caryophyllaceae	5	7

Gentianaceae	1	7
Apiaceae	5	6
Cyperaceae	3	6
Geraniaceae	2	6
Solanaceae	4	6
Boraginaceae	3	5
Scrophulariaceae	2	5
Iridaceae	1	4
Balsaminaceae	2	3
Caprifoliaceae	3	3
Chenopodiaceae	1	3
Euphorbiaceae	1	3
Papaveraceae	2	3
Pinaceae	2	3
Rubiaceae	1	3
Asparagaceae	2	2
Berberidaceae	2	2
Convolvulaceae	1	2
Onagraceae	2	2
Primulaceae	2	2
Typhaceae	2	2
Urticaceae	1	2
Adoxaceae	1	1
Alismataceae	1	1
Amaryllidaceae	1	1

Apocynaceae	1	1
Araliaceae	1	1
Campanulaceae	1	1
Cannabaceae	1	1
Ceratophyllaceae	1	1
Dioscoreaceae	1	1
Dryopteridaceae	1	1
Hamamelidaceae	1	1
Juglandaceae	1	1
Liliaceae	1	1
Lythraceae	1	1
Malvaceae	1	1
Oleaceae	1	1
Oxiladaceae	1	1
Papilionaceae	1	1
Plantanaceae	1	1
Portulacaceae	1	1
Salicaceae	1	1
Verbenaceae	1	1
Violaceae	1	1
Vitaceae	1	1
Zygophyllaceae	1	1
Total	176	268

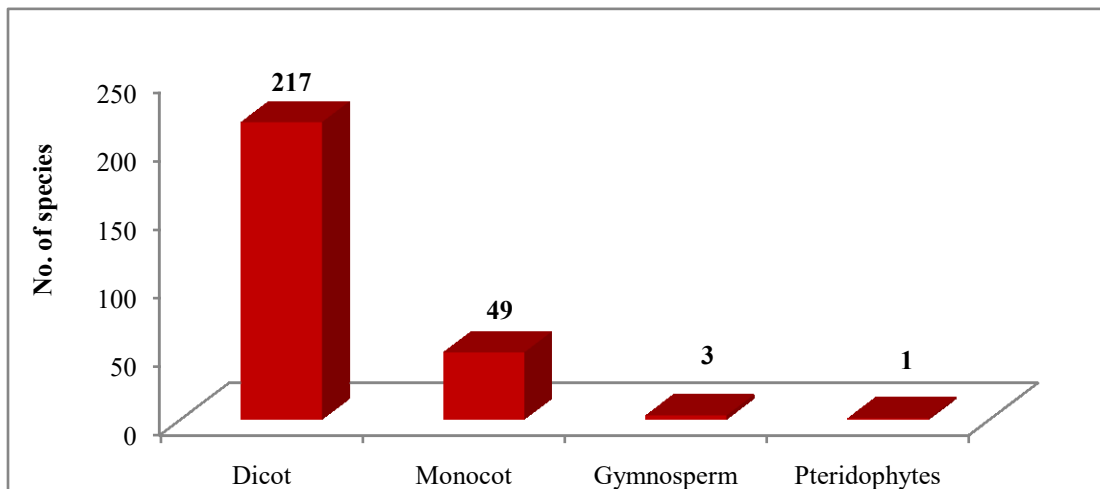


Fig.12: Number of species belonging to various taxonomic groups

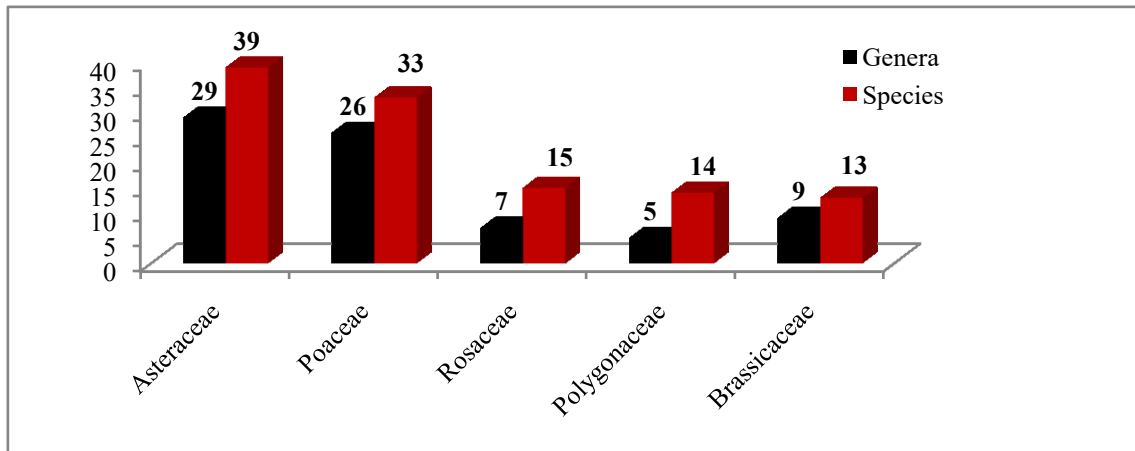


Fig. 13: Five largest families with more than ten species

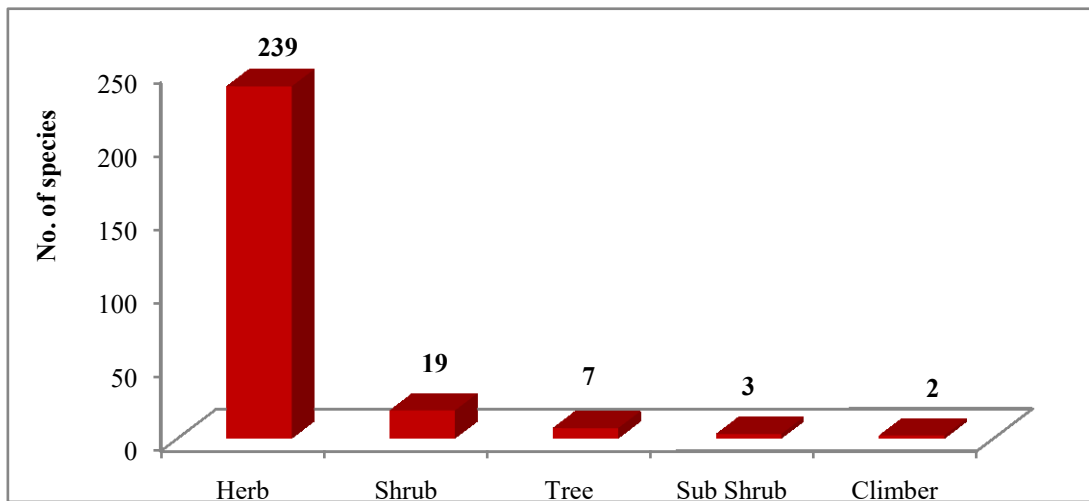


Fig.14: No. of plant species belonging to different growth forms

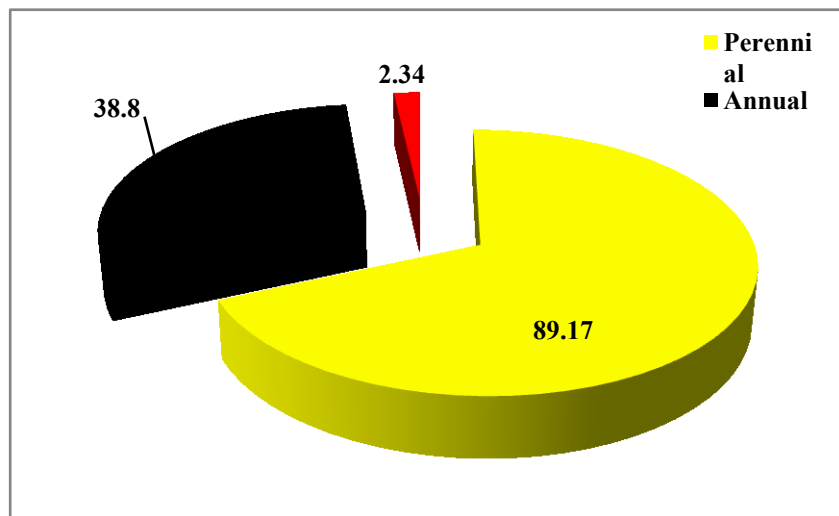


Fig.15: Percentage of various life span categories of the recorded plant species

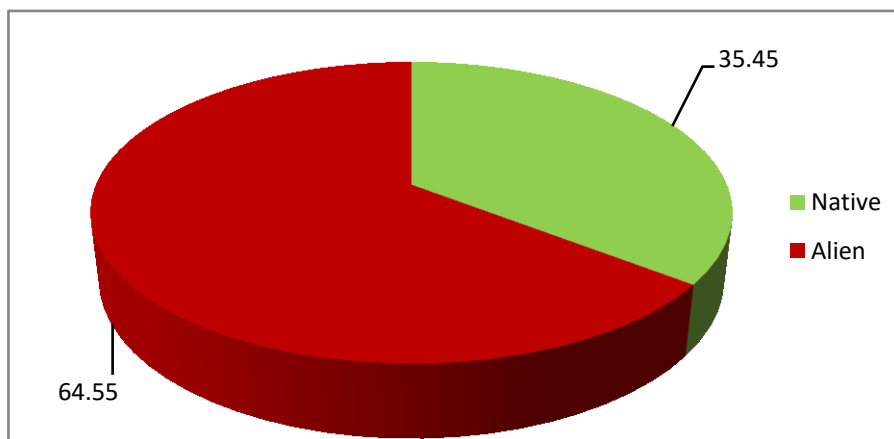


Fig.16: Percentage of native and alien plant species recorded from Kashmir

(3). Floristic diversity of Jammu:

So far 216 species were collected and identified after undertaking field surveys in different sites ; (annexure ii-a). These species belonged to 163 genera in 60 families (Table 5). Of these 60 families, 53 are dicots, 6 families are monocots and one to gymnosperm (Table 5). Amongst these recorded species, 179 species are dicots and 49 species are monocot, and 1 gymnosperm (Fig.17). The first 5 largest families include: Leguminaceae (27 species), Asteraceae (20 species), Poaceae (13 species) Lamiaceae (11 species) and Malvaceae (13 species) (Fig.18).

It has been observed in the present study that 135 species are herbs, 22 shrubs, 50 trees and 9 climbers (Fig. 19). Majority of the plant species are perennial (142 species) followed by annuals (73 species) and biannuals (1 species). The percentage composition of the life span categories is given in Fig.20.

Of the 216 plant species recorded 142 species are native and 74 are Alien. The percentage of native and alien species is depicted in Fig.21.

Table 5: Number of genera and species belonging to different families

Family	Genera	Species
Leguminaceae	17	27
Asteraceae	16	20
Poaceae	11	13
Lamiaceae	8	11
Malvaceae	8	11
Apocynaceae.	6	7
Amaranthaceae	5	9
Boraginaceae	5	6
Rubiaceae	5	7
Convolvulaceae.	4	8
Cucurbitaceae	4	4

Acanthaceae	3	3
Apiaceae	3	3
Euphorbiaceae	3	7
Meliaceae	3	3
Moraceae	3	6
Rosaceae	3	3
Anacardiaceae	2	2
Bignoniaceae	2	2
Brassicaceae	2	2
Cactaceae	2	2
Commelinaceae	2	3
Cyperaceae	2	5
Myrtaceae	2	2
Oleaceae	2	2
Paperveraceae	2	4
Primulaceae	2	2
Ranunculaceae	2	3
Rutaceae	2	2
Solanaceae	2	3
Alismataceae	1	1
Amarylidaceae	1	1
Arecaceae	1	1
Bombaceae	1	1
Caesalpinaceae	1	2
Cannabaceae	1	1

Capparaceae	1	1
Caryophyllaceae	1	1
Cleomaceae	1	2
Colchiaceae	1	1
Combretaceae	1	1
Dioscoreaceae	1	1
Ebenaceae	1	1
Fumariaceae	1	1
Liliaceae	1	1
Linaceae	1	1
Menispermaceae	1	1
Moringaceae	1	1
Nyctaginaceae	1	3
Onagraceae	1	1
Orobanchaceae	1	1
Oxalidaceae	1	1
Phrymaceae	1	1
Phyllanthaceae	1	1
Pinaceae	1	1
Plantaginaceae	1	1
Polygonaceae	1	1
Sapindaceae	1	1
Scrophulariaceae	1	1
Verbenaceae	1	1
Total	163	216

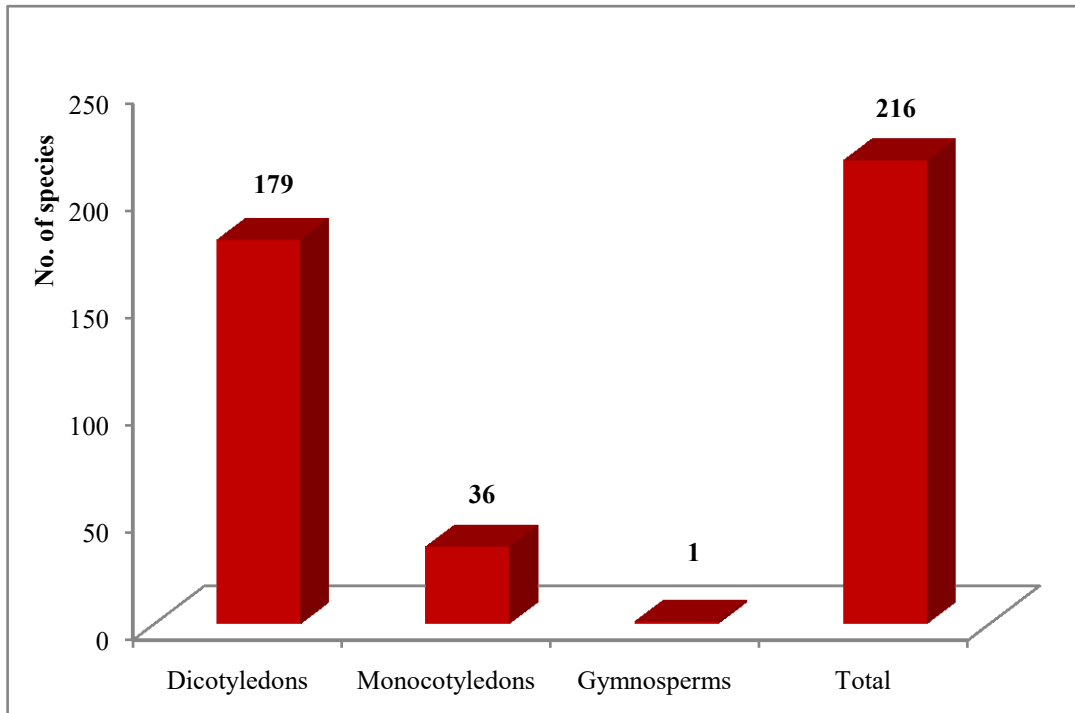


Fig.17: Number of species belonging to various taxonomic groups

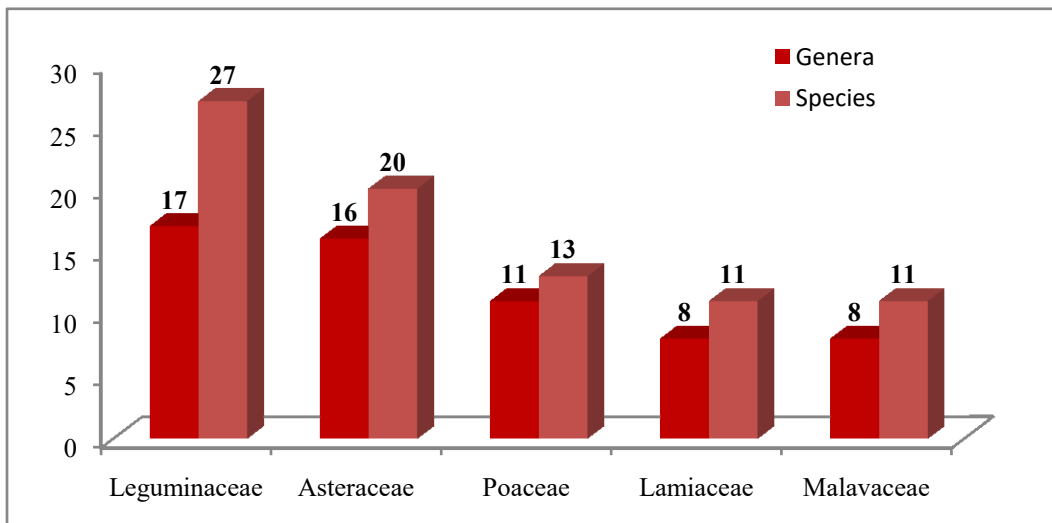


Fig.18: Five largest families with more than ten species

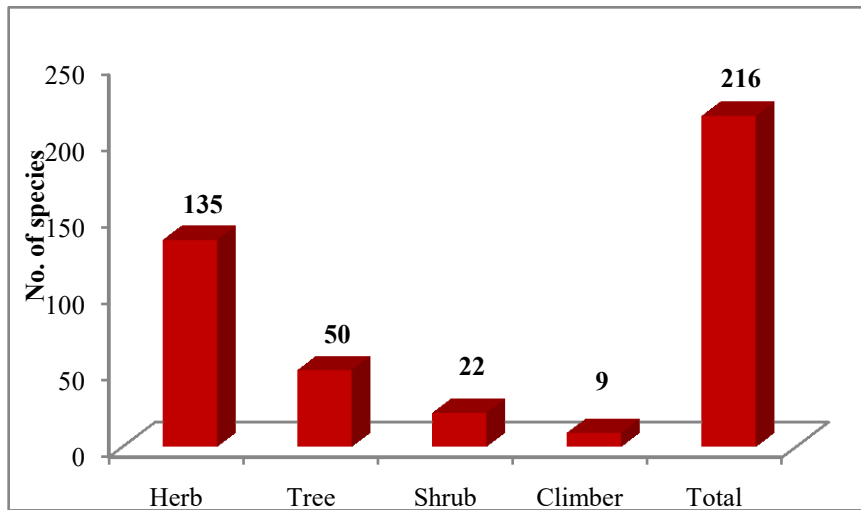


Fig.19: Number of species belonging to various growth form categories

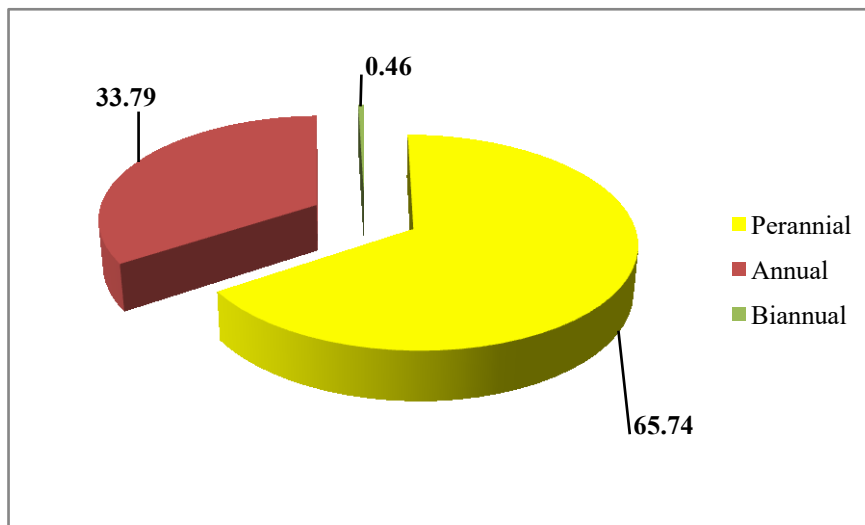


Fig. 20: percentage composition of various life span categories

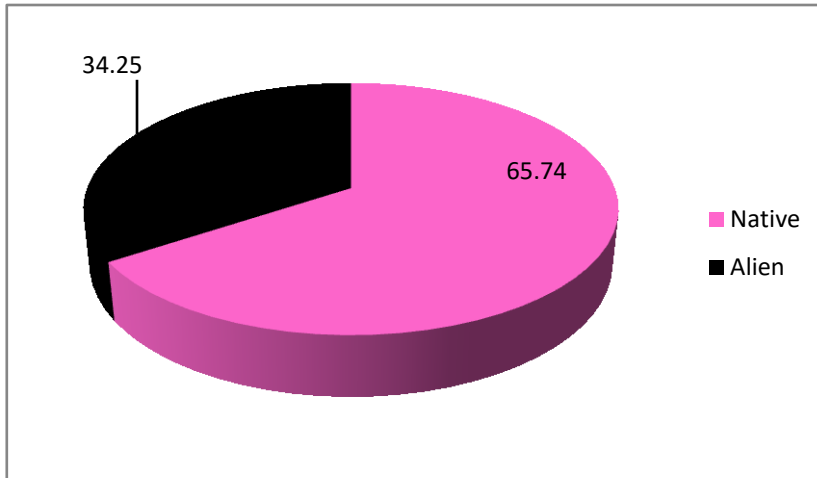


Fig.21: Percentage of native and alien plant species

Comparison of floristic diversity, taxonomic groups, growth forms, life spn categories and native and alien plant species recorded in Ladakh, Kashmir and Jammu

Region	Floristic diversity recorded											Native	Alien
	Total	Monocot	Dicot	Gymnosperms	Pteridophytes	Herbs	Shrubs	Trees	Perennial	Annual	Biannual		
Ladakh	807	148	646	7	6	720	62	16	548	238	21	718	89
Kashmir	268	49	217	3	1	239	19	7	149	104	17	95	173
Jammu	216	49	179	1	0	135	22	50	142	73	1	142	74

(B) Alien plant species load in all the three regions (Jammu Kashmir and Ladakh)

Amongst 1086 plant species recorded from three regions, 236 plant species are alien which belongs to 128 genera and 43 families (Table 6). Majority of the species are Dicots (183) followed by monocots (53) (Fig. 22). The first 5 largest families include: Asteraceae (47 species), Poaceae (34 species), Amaranthaceae (14), Brassicaceae (12) and Leguminaceae (11) (Fig. 23) and (Table 7). Among these alien species 222 were herbs, 8 were shrubs and 5 trees (Fig. 24). Majority of the species were perennials followed by annuals (Fig. 25). As far as stage of invasion is concerned most of the species were Invasive followed by Naturalised (Fig. 26). Present study demonstrated that purpose of introduction of majority of the alien species (149 species) were unintentionally in this region, followed by fodder (43 species) and ornamental purpose (12 species) and least (1 species) have been introduced for landscaping (Table 7 & Fig. 27).

Characterization of alien plant species recorded from Jammu Kashmir and Ladakh regions.

Plant Name	Family	Plant Group	Growth form	Life cycle	Region
<i>Abutilon abutiloides</i> (Jacq.) Garcke ex Hochr.	Malvaceae	Dicot	Herb	Annual	Jammu
<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	Dicot	Herb	Perennial	J&K
<i>Ageratum houstonianum</i> Mill.	Asteraceae	Dicot	Herb	Perennial	Jammu
<i>Agrimonia eupatoria</i> L.	Rosaceae	Dicot	Herb	Perennial	Kashmir
<i>Agrostis stolonifera</i> L.	Poaceae	Monocot	Herb	Perennial	Kashmir
<i>Albizia berteriana</i> (DC.) M. Gomez	Caesalpinaceae	Dicot	Herb	Perennial	Jammu
<i>Alisma lanceolatum</i> With	Alismataceae	Monocot	Herb	Perennial	Kashmir
<i>Alopecurus aequalis</i> Sobol.	Poaceae	Monocot	Herb	Biennial	Kashmir
<i>Alstonia scholaris</i> (L.) R.Br.	Apocyanaceae	Dicot	Herb	Perennial	Jammu
<i>Althaea rosea</i> Cav.	Malvaceae	Dicot	Shrub	Biennial	Kashmir
<i>Amaranthus caudatus</i> L.	Amaranthaceae	Dicot	Herb	Perennial	Kashmir, Ladakh

<i>Amaranthus cruentus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Kashmir
<i>Amaranthus graecizans</i> L.	Amaranthaceae	Dicot	Herb	Annual	Kashmir
<i>Amaranthus hybridus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Amaranthus powellii</i> S. Watson	Amaranthaceae	Dicot	Herb	Annual	Ladakh
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Amaranthus viridis</i> L.	Amaranthaceae	Dicot	Herb	Perennial	J&K
<i>Anagallis arvensis</i> L.	Primulaceae	Dicot	Herb	Annual	J&K
<i>Anthemis cotula</i> L.	Asteraceae	Dicot	Herb	Biennial	J&K ,Ladakh
<i>Arctium lappa</i> L.	Asteraceae	Dicot	Herb	Perennial	Kashmir
<i>Argemone mexicana</i> L.	Papaveraceae.	Dicot	Herb	Perennial	Jammu
<i>Artemisia absinthium</i> L.	Asteraceae	Dicot	Herb	Perennial	Kashmir
<i>Artemisia fragrans</i> Willd.	Asteraceae	Dicot	Herb	Perennial	Ladakh
<i>Arthraxon prionodes</i> Dandy.	Poaceae	Monocot	Herb	Perennial	Kashmir
<i>Axyris prostrata</i> L.	Amaranthaceae	Dicot	Herb	Annual	Ladakh
<i>Bellis perennis</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Bidens chinensis</i> Willd.	Asteraceae	Dicot	Herb	Perennial	Kashmir
<i>Borreria affinis</i> DC.	Rubiaceae	Dicot	Herb	Perennial	Jammu
<i>Bothriochloa ischaemum</i> Keng	Poaceae	Monocot	Herb	Perennial	Kashmir
<i>Brassica napus</i> L.	Brassicaceae	Dicot	Herb	Annual	Kashmir
<i>Brassica nigra</i> Koch	Brassicaceae	Dicot	Herb	Biennial	Kashmir
<i>Bromus danthoniae</i> Trin. in C.A. Mey.	Poaceae	Monocot	Herb	Annual	Kashmir, Ladakh
<i>Bromus gracillimus</i> Bunge	Poaceae	Monocot	Herb	Annual	Kashmir, Ladakh

<i>Bromus japonicus</i> Thunb.	Poaceae	Monocot	Herb	Perennial	Kashmir
<i>Bupleurum abchasicum</i> Manden.	Apiaceae	Monocot	Herb	Annual	Kashmir
<i>Calendula officinalis</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Calotropis procera</i> (Willd.) R.Br.	Apocynaceae.	Dicot	Herb	Perennial	Jammu
<i>Cannabis sativa</i> L.	Cannabaceae	Dicot	Herb	Perennial	J&K Ladakh
<i>Carduus edelbergii</i> Rech. f.	Asteraceae	Dicot	Herb	Biennial	Kashmir
<i>Carexatrofusca</i> Schkuhr.	Cyperaceae	Monocot	Herb	Perennial	Ladakh
<i>Carex microglochin</i> Wahlenb.	Cyperaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Carex sagaensis</i> C. Yang	Cyperaceae	Monocot	Herb	Perennial	Ladakh
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Apocynaceae	Dicot	Herb	Annual	Jammu
<i>Centaurea iberica</i> Trevir. ex Spreng.	Asteraceae	Dicot	Herb	Perennial	Kashmir
<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	Dicot	Herb	Perennial	Kashmir
<i>Cheiranthus cheiri</i> L.	Brassicaceae	Dicot	Herb	Perennial	Kashmir
<i>Chenopodium foliosum</i> (Moench) Ascherson	Amaranthaceae	Dicot	Herb	Perennial	Ladakh
<i>Chenopodium album</i> L	Amaranthaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Chenopodium glaucum</i> L.	Amaranthaceae	Dicot	Herb	Annual	Ladakh
<i>Chenopodium hybridum</i> L.	Chenopodiaceae	Dicot	Herb	Perennial	Kashmir
<i>Chenopodium karoii</i> (Murr) Aellen	Amaranthaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Chenopodium pamiricum</i> Iljin	Amaranthaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Dicot	Herb	Perennial	Kashmir, Ladakh

<i>Cirsium wallichii</i> DC.	Asteraceae	Dicot	Herb	Biennial	Kashmir
<i>Clematis orientalis</i> L. Tiktikama.	Ranunculaceae	Dicot	Herb	Perennial	Ladakh
<i>Conium maculatum</i> L.	Apiaceae	Dicot	Herb	Perennial	Kashmir
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Dicot	Herb	Perennial	J&K ,Ladakh
<i>Convolvulus falcatus</i> L.	Convolvulaceae	Dicot	Herb	Perennial	Kashmir
<i>Conyza bonariensis</i> Cronquist	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Conyza canadensis</i> (L.)Cronquist	Asteraceae	Dicot	Herb	Annual	J&K ,Ladakh
<i>Conyza sumatrensis</i> (S.F.Blake) Pruski&G.Sancho	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Cosmos bipinnatus</i> Cav.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Cymbopogon pospischilii</i> (K.Schum.) C.E.Hubb.	Poaceae	Monocot	Herb	Perennial	Jammu
<i>Cynodondactylon</i> (L.) Pers.	Poaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Cyperus sanguinolentus</i> L.	Cyperaceae	Monocot	Herb	Perennial	Kashmir
<i>Datura innoxia</i> Mill.	Solanaceae	Dicot	Herb	Annual	J&K, Ladakh
<i>Datura meteloides</i> Dunal	Solanaceae	Dicot	Herb	Perennial	Kashmir
<i>Datura stramonium</i> L.	Solanaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Digitaria ciliaris</i> L	Poaceae	Monocot	Herb	Annual	Kashmir
<i>Dysphania botrys</i> (L.) Mosyakin&Clemants.	Amaranthaceae	Dicot	Herb	Annual	Ladakh
<i>Eichhornia crassipes</i> (Mart.) Solms.	Pontederiaceae	Monocot	Herb	Annual 1	J&K

<i>Eleocharis acicularis</i> L.	Cyperaceae	Monocot	Herb	Perennial	Kashmir
<i>Epilobium hirsutum</i> L.	Onagraceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Epipactis helleborine</i> (L.) Crantz.	Orchidaceae	Monocot	Herb	Perennial	Ladakh
<i>Eragrostis poaeoides</i> P. Beauv.	Poaceae	Monocot	Herb	Annual	Kashmir
<i>Erigeron annuus</i> Pers.	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	Dicot	Herb	Perennial	Kashmir
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dicot	Tree	Perennial	J&k
<i>Euphorbia hispida</i> Boiss.	Euphorbiaceae	Dicot	Herb	Perennial	Ladakh
<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	Dicot	Shrub	Perennial	J&K
<i>Euphorbia tibetica</i> Boiss.	Euphorbiaceae	Dicot	Herb	Perennial	Ladakh
<i>Evolvulus sinoides</i> (L.) L.	Convolvulaceae	Dicot	Herb	Perennial	Jammu
<i>Fumaria indica</i> (Hauskn.) Pugsley	Papaveraceae	Dicot	Herb	Perennial	Jammu
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Dicot	Herb	Annual	Ladakh, Kashmir
<i>Galium aparine</i> L.	Rubiaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Galium boreale</i> L.	Rubiaceae	Dicot	Herb	Annual	Ladakh
<i>Galium palustre</i> L.	Rubiaceae	Dicot	Herb	Perennial	Kashmir
<i>Galium pauciflorum</i> Bunge	Rubiaceae	Dicot	Herb	Annual	Ladakh
<i>Galium spurium</i> L.	Rubiaceae	Dicot	Herb	Annual	Ladakh
<i>Galium verum</i> L.	Rubiaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Geum urbanum</i> L.	Rosaceae	Dicot	Herb	Perennial	Kashmir
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i> Kanis ex J. Palmer	Amaranthaceae	Dicot	Herb	Annual	Jammu

<i>Helianthus annuus</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Heracleum lanatum</i> Michx.	Apiaceae	Dicot	Tree	Perennial	Kashmir, Jammu
<i>Herminium monorchis</i> (L.) R.Br.	Orchidaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Hesperismatronalis</i> L.	Brassicaceae	Dicot	Herb	Biennial	Kashmir
<i>Hordeum murinum</i> L.	Poaceae	Monocot	Herb	Annual	Kashmir
<i>Hyoscyamus niger</i> L.	Solanaceae	Dicot	Herb	Biennial	Kashmir
<i>Hyptissuaveolens</i> (L.) Poit.	Lamiaceae	Dicot	Herb	Annual	Jammu
<i>Iberis amara</i> L.	Brassicaceae	Dicot	Herb	Annual	Kashmir
<i>Impatiens balsamina</i> L.	Balsaminaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Impatiens glandulifera</i> Royle	Bulsimaceae	Dicot	Herb	Annual	Kashmir
<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Dicot	Herb	Perennial	Jammu
<i>Ipomoea carnea</i> (Mart. Ex Choisy) Austin.	Convolvulaceae.	Dicot	Herb	Perennial	Jammu
<i>Iris domestica</i> (L.) Goldblatt &Mabb	Iridaceae	Monocot	Shrub	Perennial	Kashmir
<i>Iris ensata</i> Thunb.	Iridaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Iris hookeriana</i> Foster.	Iridaceae	Monocot	Herb	Perennial	Ladakh
<i>Iris lactea</i> Pall.	Iridaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Juglans regia</i> L.	Juglandaceae	Dicot	Tree	Perennial	J&K, Ladakh
<i>Juncus turkestanicus</i> Krecz. &Gontsch.	Juncaceae	Monocot	Herb	perennial	Ladakh
<i>Kigelia africana</i> (Lam.) Benth.	Bignoniaceae	Dicot	Herb	Perennial	Jammu
<i>Lactucadissecta</i> D. Don	Asteraceae	Dicot	Herb	Annual	Kashmir,

					Ladakh
<i>Lactucalessertiana</i> (Wall. ex DC.) Wall. ex C.B.Clarke.	Asteraceae	Dicot	Herb	Annual	Ladakh
<i>Lactucaorientalis</i> (Boiss.) Boiss.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Lactuca sativa</i> L.	Asteraceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Lactucatararica</i> (L.) C.A.Mey.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Lantana camara</i> L.	Verbenaceae	Dicot	Herb	Perennial	Jammu
<i>Lepidium sativum</i> L.	Brassicaceae	Dicot	Herb	Perennial	Jammu
<i>Lepidium virginicum</i> L.	Brassicaceae	Dicot	Herb	Annual	Kashmir
<i>Lepyrodiclisholosteoides</i> (C.A. Mey.) Fenzl ex Fisch. & C.A. Mey.	Caryophyllaceae	Dicot	Herb	Annual	Ladakh
<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Dicot	Tree	Perennial	Jammu
<i>Lithospermum arvense</i> L.	Boraginaceae	Dicot	Herb	Annual	Kashmir
<i>Lolium perenne</i> L.	Poaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Lolium temulentum</i> L.	Poaceae	Monocot	Herb	Annual	Kashmir
<i>Lotus corniculatus</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir
<i>Lychnis coronaria</i> Desr.	Caprifoliaceae	Dicot	Herb	Perennial	Kashmir
<i>Lysimachia arvensis</i> (L.) U.Manns&Anderb.	Primulaceae	Dicot	Herb	Annual	Jammu
<i>Lythrumhyssopifolia</i> L.	Lythraceae	Dicot	Herb	Annual	Kashmir
<i>Malcolmiaafricana</i> R. Br.	Brassicaceae	Dicot	Herb	Annual	Kashmir
<i>Mallotusphilippensis</i> (Lam.) Müll.Arg.	Euphorbiaceae	Dicot	Herb	Annual	Jammu
<i>Malva parviflora</i> L.	Malvaceae	Dicot	Herb	Perennial	J&K

					Ladakh
<i>Malvastrum coromandelium</i> (L.) Garcke	Malvaceae	Dicot	Shrub	Perennial	Jammu
<i>Marrubium vulgare</i> L.	Lamiaceae	Dicot	Herb	Perennial	Kashmir
<i>Medicago falcata</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Medicago lupulina</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Medicago polymorpha</i> L.	Leguminaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Medicago sativa</i> L.	Leguminaceae	Dicot	Herb	Biennial	Kashmir, Ladakh
<i>Melilotus albus</i> Medik.	Fabaceae	Dicot	Herb	Annual	Jammu, Laakh
<i>Mentha longifolia</i> Benth. in Wall.	Lamiaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Morus alba</i> L.	Moraceae	Dicot	Tree	Perennial	Kashmir, Ladakh
<i>Myosotis micrantha</i> auct. non Pall. ex Lehm.	Boraginaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Narcissus tazetta</i> L.	Amaryllidaceae	Dicot	Herb	Annual	Kashmir
<i>Oenothera rosea</i> Ait	Onagraceae	Dicot	Herb	Annual	Kashmir
<i>Onopordum acanthium</i> L.	Asteraceae	Dicot	Herb	Perennial	Kashmir
<i>Oxalis corniculata</i> L.	Oxalidaceae	Dicot	Shrub	Perennial	J&k& Ladakh
<i>Papaver dubium</i> L.	Papaveraceae	Dicot	Herb	Annual	J&K, Ladakh
<i>Papaver hybridum</i> L.	Papaveraceae	Dicot	Herb	Annual	J&K
<i>Papaver rhoeas</i> Linn.	Papaveraceae	Dicot	Herb	Annual	Kashmir, Ladakh

<i>Parthenium hysterophorus</i> L.	Asteraceae	Dicot	Shrub	Perennial	J&K
<i>Pergulariadaemia</i> (Forssk.) Chiov.	Apocynaceae	Dicot	Shrub	Perennial	Jammu
<i>Pergularia extensa</i> (Jacq.) N.E. Br.	Apocynaceae	Dicot	Herb	Annual	Jammu
<i>Persicarianepalensis</i> (Meisn.) Miyabe.	Polygonaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Persicariaorientalis</i> L.	Polygonaceae	Dicot	Herb	Annual	Kashmir
<i>Petunia hybrida</i> Vilm	Solanaceae	Dicot	Herb	Biennial	Kashmir
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Piptatherumlaterale</i> (Regel) Nevski.	Poaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Pisum sativum</i> L.	Leguminaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Plantanus occidentalis</i> L	Plantanaceae	Dicot	Herb	Perennial	Kashmir
<i>Poa annua</i> L.	Poaceae	Monocot	Herb	Perennial	J&K, Ladakh
<i>Poa alpina</i> L.	Poaceae	Monocot	Herb	perennial	Kashmir, Ladakh
<i>Poa angustata</i> R.Br.	Poaceae	Monocot	Herb	Perennial	Kashmir, Ladakh
<i>Poa attenuata</i> Trin.	Poaceae	Monocot	Herb	perennial	Kashmir, Ladakh
<i>Poa tibetica</i> Munro ex Stapf in Hook. f.	Poaceae	Monocot	Herb	Perennial	Ladakh
<i>Polygonum abbreviatum</i> Kom.	Polygonaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Polygonum aviculare</i> L.	Polygonaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Polygonum hydropiper</i> L	Poaceae	Monocot	Herb	Perennial	Kashmir

<i>Polygonum minus</i> Huds.	Polygonaceae	Dicot	Herb	Annual	Kashmir
<i>Polygonum orientale</i> L.	Polygonaceae	Dicot	Herb	Annual	Kashmir
<i>Polygonum rottboellioides</i> Jaub. &Spach.	Polygonaceae	Dicot	Herb	Perennial	Ladakh
<i>Polypogon fugax</i> Ness ex Steud.	Poaceae	Monocot	Herb	Perennial	Kashmir
<i>Populus alba</i> L.	Salicaceae	Dicot	Tree	Perennial	Kashmir
<i>Populus pannonica</i> Kit. ex Besser.	Salicaceae	Dicot	Tree	Perennial	Ladakh
<i>Portulaca oleracea</i> L	Portulacaceae	Dicot	Herb	Annual	Kashmir
<i>Portulaca oleracea</i> L.	Portulacaceae	Dicot	Herb	Perennial	Ladakh
<i>Potamogeton crispus</i> L.	Potamogetonaceae	Dicot	Herb	Annual	Ladakh
<i>Potamogeton perfoliatus</i> L.	Potamogetonaceae	Dicot	Herb	Annual	Ladakh
<i>Potentilla reptans</i> L.	Rosaceae	Dicot	Herb	Perennial	Kashmir
<i>Prosopis juliflora</i> (Sw.) DC.	Fabaceae	Dicot	Herb	Perennial	Jammu
<i>Psephellusdealbatus</i> (Willd.) C. Koch	Asteraceae	Dicot	Herb	Perennial	Ladakh
<i>Puccinellia distans</i> (Jacquem.) Parl.	Poaceae	Monocot	Herb	Annual	Ladakh
<i>Randia spinosa</i> (Thunb.) Poir.	Rubiaceae	Dicot	Herb	Perennial	Jammu
<i>Ranunculus abortivus</i> L.	Ranunculaceae	Dicot	Herb	Annual	Kashmir
<i>Ranunculus laetus</i> Wall.exHook.f.& Thomson	Ranunculaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Ranunculus muricatus</i> L.	Ranunculaceae	Dicot	Herb	Perennial	Kashmir
<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Dicot	Herb	Annual	Kashmir
<i>Ricinus communis</i> Linn.	Euphorbiaceae	Dicot	Tree	Perennial	Jammu
<i>Ricinus communis</i> L.	Euphorbiaceae	Dicot	Sub shrub	Perennial	Kashmir, Ladakh
<i>Robiniapseudacacia</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir,

					Ladakh
<i>Robiniapseudacacia</i> L.	Leguminaceae	Dicot	Tree	Perennial	Ladakh
<i>Rosa brunonii</i> Lindl.	Rosaceae	Dicot	Shrub	Perennial	Kashmir
<i>Rubus ellipticus</i> Sm.	Rosaceae	Dicot	Herb	Annual	Jammu
<i>Rubus vestitus</i> Weihe	Rosaceae	Dicot	Herb	Perennial	Kashmir
<i>Rumex dentatus</i> L.	Polygonaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Rumex patientia</i> L.	Polygonaceae	Dicot	Herb	Perennial	Ladakh
<i>Salix caesia</i> Vill.	Salicaceae	Dicot	Shrub	perennial	Ladakh
<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Scandix pecten-veneris</i> L.	Apiaceae	Dicot	Herb	Annual	Kashmir
<i>Scirpus acutus</i> Muhl. ex Bigelow	Cyperaceae	Monocot	Herb	Annual	Jammu
<i>Scirpus articulatus</i> L.	Cyperaceae	Monocot	Herb	Annual	Jammu
<i>Scirpus subterminalis</i> Torr.	Cyperaceae	Monocot	Herb	Perennial	Jammu
<i>Senna occidentalis</i> (L.) Link	Fabaceae	Dicot	Herb	Perennial	Jammu
<i>Setaria viridis</i> P. Beauv.	Poaceae	Monocot	Herb	Annual	Kashmir
<i>Sida spinosa</i> L.	Malvaceae	Dicot	Shrub	Perennial	Jammu
<i>Siegesbeckia orientalis</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir
<i>Sisymbrium loeselii</i> Linn.	Brassicaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Solanum nigrum</i> L.	Solanaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Sonchus arvensis</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Dicot	Herb	Annual	Jammu

<i>Sonchus oleraceus</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Stellaria media</i> Cyr	Caryophyllaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Stipa mongholica</i> Turcz. ex Trin.	Poaceae	Monocot	Herb	Annual	Ladakh
<i>Tagetes erecta</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Tagetes minuta</i> L.	Asteraceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Taraxacum officinale</i> (L.) Weber ex F.H.Wigg.	Asteraceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Trapa natans</i> L.	Typhaceae	Monocot	Herb	Perennial	Kashmir
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Dicot	Herb	Annual	Kashmir
<i>Tridax procumbens</i> (L.) L.	Asteraceae	Dicot	Herb	Perennial	Jammu
<i>Trifolium pratense</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Trifolium repens</i> L.	Leguminaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Typha angustifolia</i> L.	Typhaceae	Monocot	Herb	Perennial	Kashmir
<i>Urtica dioica</i> L.	Urticaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Verbascum thapsus</i> L.	Scrophulariaceae	Dicot	Herb	Perennial	Kashmir, Ladakh
<i>Viola tricolor</i> L.	Vitaceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Vitis negundo</i> L.	Lamiaceae	Dicot	Shrub	Perennial	Jammu
<i>Xanthium spinosum</i> L.	Asteraceae	Dicot	Herb	Annual	Kashmir, Ladakh
<i>Xanthium strumarium</i> Linn.	Asteraceae	Dicot	Herb	Perennial	J&K ,Ladakh

Table 6: Number of genera and species belonging to different families

Family	No. of Genra	No. of species
Asteraceae	29	47
Poaceae	10	34
Amaranthaceae	5	14
Brassicaceae	7	12
Leguminaceae	6	11
Polygonaceae	3	10
Rubiaceae	1	8
Cyperaceae	3	7
Solanaceae	4	7
Caryophyllaceae	6	6
Iridaceae	1	6
Rosaceae	6	6
Apiaceae	5	5
Euphorbiaceae	1	5
Potamogetonaceae	1	5
Ranunculaceae	2	5
Lamiaceae	3	4
Papaveraceae	1	4
Boraginaceae	3	3
Chenopodiaceae	1	3
Convolvulaceae	2	3
Salicaceae	2	3
Scrophulariaceae	2	3

Balsaminaceae	1	2
Caprifoliaceae	2	2
Onagraceae	2	2
Orchidaceae	2	2
Typhaceae	2	2
Alismataceae	1	1
Apocynaceae	1	1
Asparagaceae	1	1
Cannabaceae	1	1
Juglandaceae	1	1
Juncaceae	1	1
Malvaceae	1	1
Moraceae	1	1
Oxiladaceae	1	1
Plantanaceae	1	1
Portulacaceae	1	1
Primulaceae	1	1
Vitaceae	1	1
Zygophyllaceae	1	1
Adoxaceae	1	1
Total	128	236

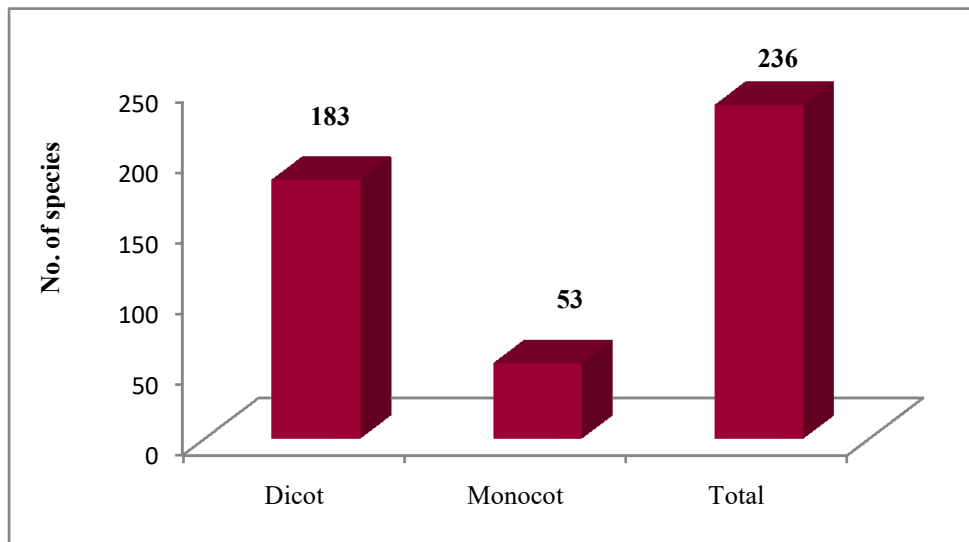


Fig. 22: Number of species belonging to various taxonomic groups

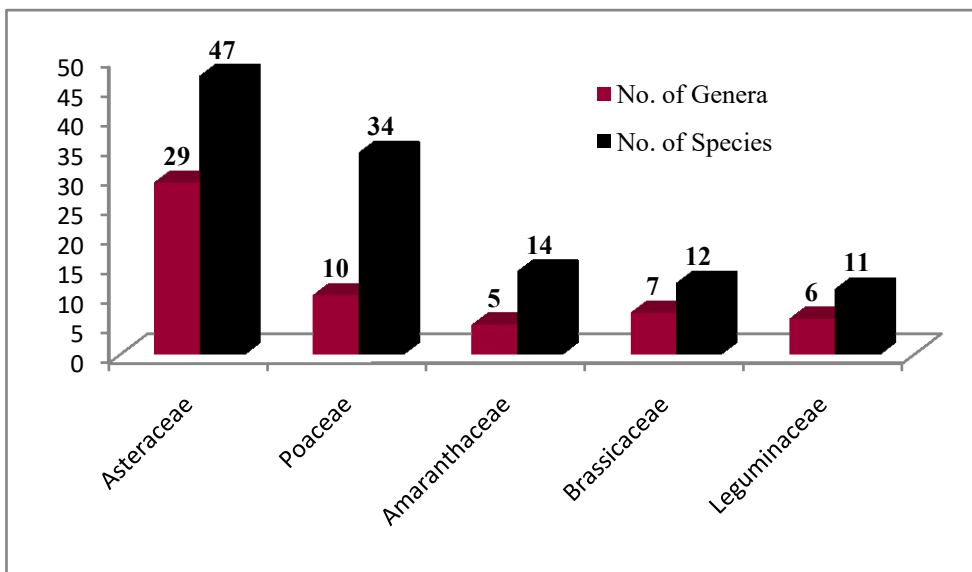


Fig. 23: Five largest families with more than ten species

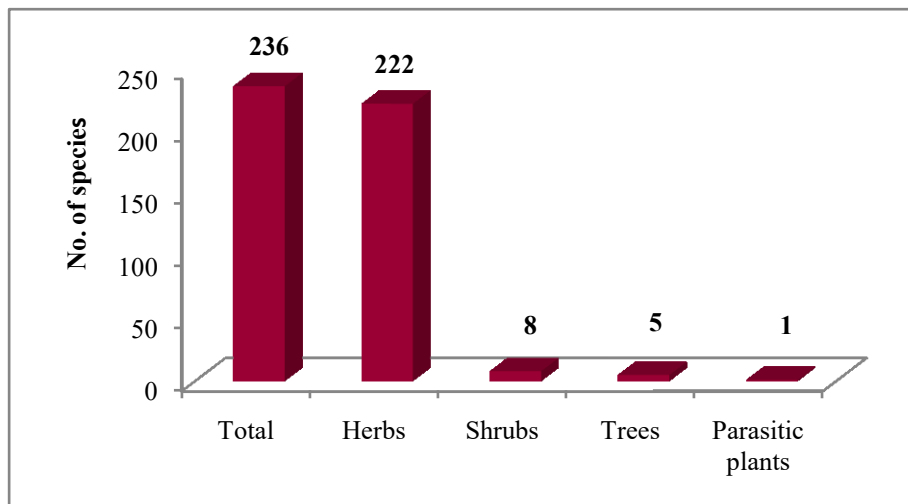


Fig.24: Number of plant species belonging to different growth forms

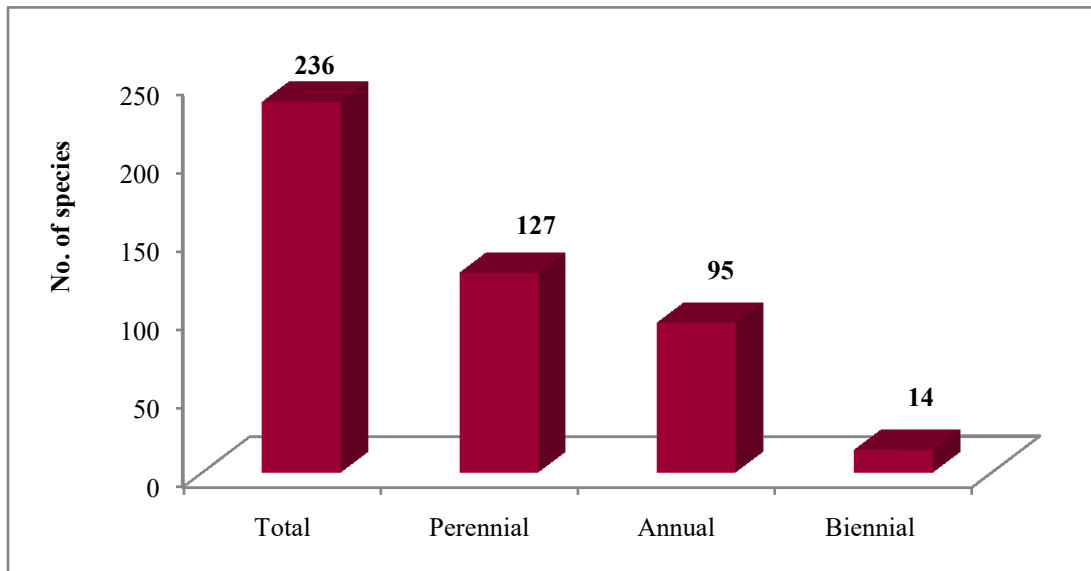


Fig.25: Number of plant species belonging to different Life span categories

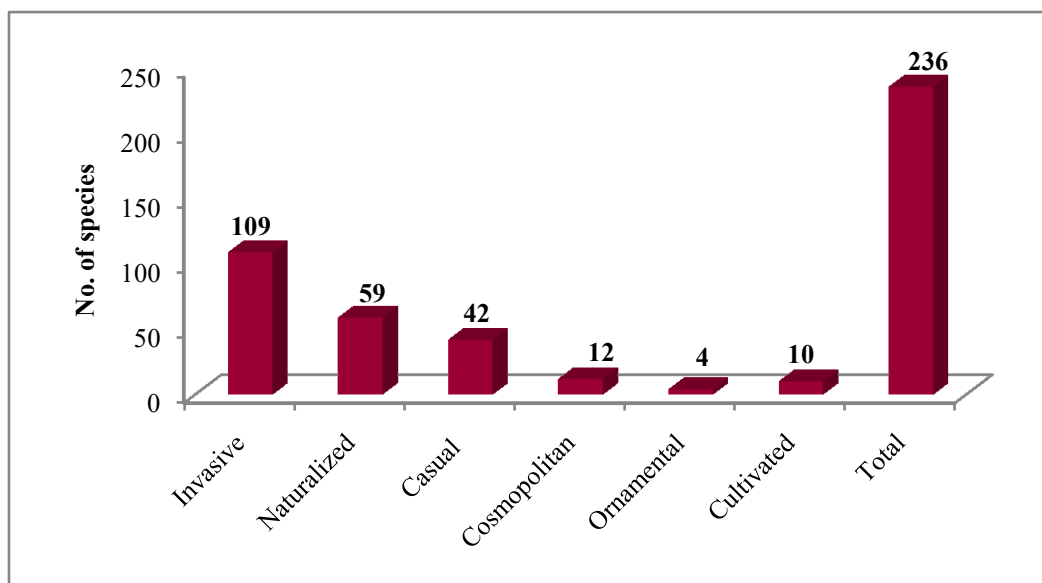


Fig. 26: Number of plant species with invasion status

Table 7: Contribution of various biogeographical regions to the alien flora Kashmir and Ladakh

Native region	No. of Plants
Europe	141
North America	27
Africa	24

South America	14
Aisa	7
Aisa temperate	6
Africa Europe	5
Tropical America	4
Africa ,Aisa	2
Europe Africa	2
Georgia	1
Maxcia	1
Mediterranean	1
South Africa	1
Total	236

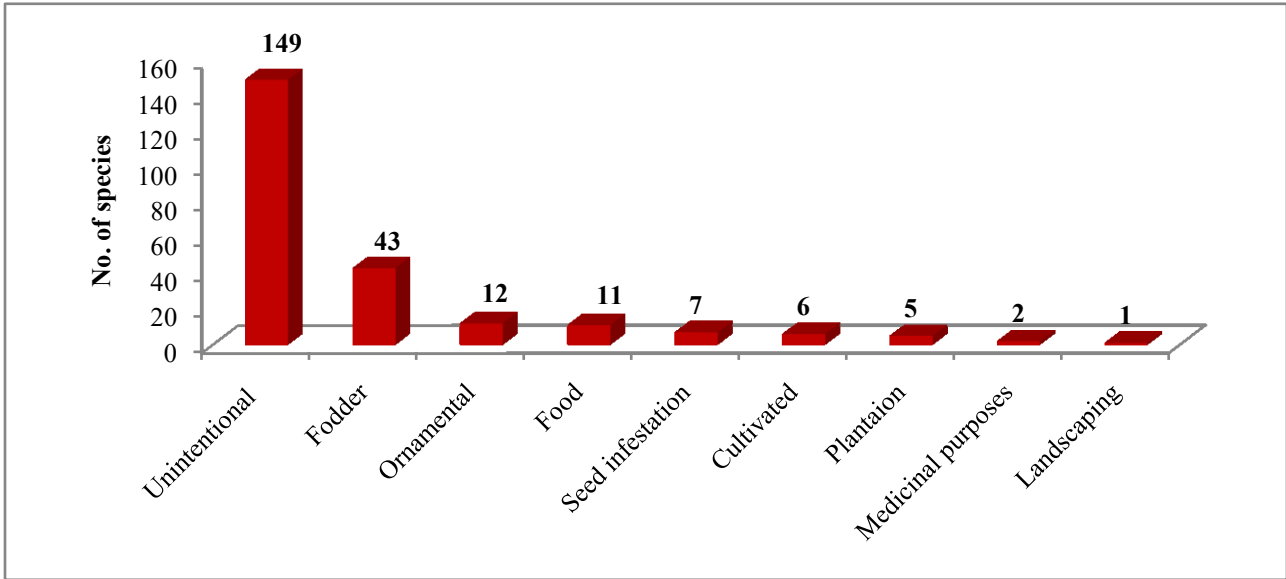


Fig. 27: Number of alien plant species and their purpose for introduction to Kashmir and Ladakh.

(1) Invasion load in Ladakh region of Trans-Himalaya:

The 89 alien species recorded in Ladakh region belong to 57 genera in 24 families. Of these 18 families belong to dicots and 6 to monocots (Table 8). Amongst angiosperms, 64 species are dicots and 25 species are monocot (Fig.28). The first 5 largest families include: Asteraceae (16 species), Poaceae (14 species), Amaranthaceae (10 species) Rubiaceae (6 species) and Amaranthaceae (11 species) and leguminaceae (6 species) (Fig.29).

The study revealed that 84 alien species are herbs, 3 trees, 1 shrub and 1 parasitic plant. The percentage composition of these life forms is given in Fig. 30. Majority of the alien plant species are perennial (45 species) followed by annuals (44 species).

The present study revealed that native distributional range of majority of these alien species is Europe followed by North American species (Fig. 31). It has also been recorded in the present study that purpose of introduction of majority of the alien species (51 spp.) were unintentionally in this region, followed by fodder (18 spp.), and seed infestation (7 spp.) and least (1 species) have been introduced for landscaping (Fig.32).

According to the invasion criteria followed in the present study most of the naturalized species (35 species) fall in stage 'II' of invasion, 18 species in stage 'III', 14 species in 'IVa' stage, 8 species in 'IVb', and 14 species in stage 'V' of invasion. The top ten invasive species of Ladakh region is depicted in Table 9.

Some of the native species growing in Ladakh region which are wide in nature are shown in Table 10.

Alien flora of Ladakh region, their ecological attributes and stages of invasion

Plant Name	Family	Plant Group	Growth form	Life span category	Mode of introduction	Alien Category	Nativity range	Frequency %*	Invasion Stage
<i>Chenopodium pamiricum</i> Iljin	Amaranthaceae	Dicot	Herb	Perennial	Agricultural	Casual	Asia temperate	15	II
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Dicot	Herb	Annual	Agricultural	Invasive	Tropical America	41	IVb
<i>Sisymbrium loeselii</i> Linn.	Brassicaceae	Dicot	Herb	Annual	Agricultural	Casual	Africa Europe	13	II
<i>Lepyrodi clisholosteoides</i> (C. A. Mey.) Fenzl ex Fisch. & C.A. Mey.	Caryophyllaceae	Dicot	Herb	Annual	Agricultural	Invasive	Tropical America	74	v
<i>Papaver dubium</i> L.	Papaveraceae	Dicot	Herb	Annual	Agricultural	Casual	Aisa	12	II
<i>Papaver rhoeas</i> Linn.	Papaveraceae	Dicot	Herb	Annual	Agricultural	Casual	Aisa	10	II
<i>Solanum nigrum</i> L.	Solanaceae	Dicot	Herb	Annual	Agricultural	Casual	Tropical America	11	II
<i>Chenopodium glaucum</i> L.	Amaranthaceae	Dicot	Herb	Annual	Fodder	Invasive	Europe	45	IVa
<i>Chenopodium album</i> L.	Amaranthaceae	Dicot	Herb	Annual	Fodder	Invasive	Aisa	44	IVa
<i>Chenopodium karoii</i> (Murr) Aellen	Amaranthaceae	Dicot	Herb	Annual	Fodder	Invasive	Europe	64	V

<i>Amaranthus caudatus</i> L.	Amaranthaceae	Dicot	Herb	Perennial	Fodder	Invasive	Europe	43	IVb
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Dicot	Herb	Perennial	fodder	Invasive	South America	67	V
<i>Iris hookeriana</i> Foster.	Iridaceae	Monocot	Herb	Perennial	Fodder	Invasive	Europe	39	IVa
<i>Iris lactea</i> Pall.	Iridaceae	Monocot	Herb	Perennial	Fodder	Invasive	North America	65	V
<i>Trifolium pratense</i> L.	Leguminaceae	Dicot	Herb	Perennial	Fodder	Invasive	Aisa	43	IV b
<i>Medicago falcata</i> L.	Leguminaceae	Dicot	Herb	Perennial	Fodder	Invasive	Europe	66	V
<i>Medicago lupulina</i> L	Leguminaceae	Dicot	Herb	Perennial	Fodder	Invasive	Europe	74	IV a
<i>Trifolium repens</i> L.	Leguminaceae	Dicot	Herb	Perennial	Fodder	Invasive	North America	49	IVa
<i>Poa alpina</i> L.	Poaceae	Monocot	Herb	perennial	fodder	Naturalized	Europe	25	III
<i>Bromus gracillimus</i> Bunge	Poaceae	Monocot	Herb	Annual	Fodder	Invasive	North America	47	IVa
<i>Stipa capillata</i> L.	Poaceae	Monocot	Herb	Annual	Fodder	Invasive	Africa Europe	58	V
<i>Stipa mongholica</i> Turcz. ex	Poaceae	Monoco	Herb	Annual	Fodder	Naturalise	Africa	23	III

Trin.		t				d	Europe		
<i>Bromus danthoniae</i> Trin. in C.A. Mey.	Poaceae	Monocot	Herb	Annual	Fodder	Invasive	Europe	41	IVa
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Monocot	Herb	Perennial	Fodder	Naturalised	Europe	35	III
<i>Polygonum aviculare</i> L.	Polygonaceae	Dicot	Herb	Annual	Fodder	Naturalised	Europe	31	III
<i>Amaranthus hybridus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Food	Invasive	Europe	39	IVb
<i>Amaranthus powellii</i> S. Watson	Amaranthaceae	Dicot	Herb	Annual	Food	Casual	Europe	16	II
<i>Chenopodium foliosum</i> (Moench) Ascherson	Amaranthaceae	Dicot	Herb	Perennial	Food	Invasive	Europe	43	IVa
<i>Taraxacum officinale</i> L.	Asteraceae	Dicot	Herb	perennial	Food	Invasive	Europe	61	V
<i>Portulaca oleracea</i> L.	Portulacaceae	Dicot	Herb	Perennial	Food	Invasive	Europe	40	IVa
<i>Artemisia fragrans</i> Willd.	Asteraceae	Dicot	Herb	Perennial	Landscaping	Invasive	Europe	53	IVa
<i>Mentha longifolia</i> Benth. in Wall.	Lamiaceae	Dicot	Herb	Perennial	Medicinal	Invasive	South America	49	IVb
<i>Helianthus annuus</i> L.	Asteraceae	Dicot	Herb	Annual	Ornamental	Casual	Mediterranean	17	II

<i>Cosmos bipinnatus</i> Cav.	Asteraceae	Dicot	Herb	Annual	Ornamental	Casual	Maxcia	46	II
<i>Robiniapseudacacia</i> L.	Leguminaceae	Dicot	Tree	Perennial	Plantation	Naturalised	Europe	34	III
<i>Morus alba</i> L.	Moraceae	Dicot	Tree	Perennial	Plantation	Naturalised	Africa	41	III
<i>Populus pannonica</i> Kit. ex Besser.	Salicaceae	Dicot	Tree	Perennial	Plantation	Naturalised	Europe	32	III
<i>Salix caesia</i> Vill.	Salicaceae	Dicot	Shrub	perennial	Plantation	Naturalised	Africa Europe	30	III
<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	Dicot	Herb	Perennial	Unintentional	Casual	Africa ,Aisa	19	II
<i>Axyrisprostrata</i> L.	Amaranthaceae	Dicot	Herb	Annual	Unintentional	Invasive	North America	15	IVa
<i>Dysphaniabotrys</i> (L.) Mosyakin & Clemants.	Amaranthaceae	Dicot	Herb	Annual	Unintentional	Invasive	South America	63	V
<i>Anthemiscotula</i> L.	Asteraceae	Dicot	Herb	Perennial	Unintentional	Casual	Europe	17	II
<i>Psephellusdealbatus</i> (Willd.) C. Koch	Asteraceae	Dicot	Herb	Perennial	Unintentional	Casual	Europe	11	II
<i>Lactucatararica</i> (L.) C.A.Mey.	Asteraceae	Dicot	Herb	Annual	Unintentional	Invasive	Aisa	64	V
<i>Lactucalessertiana</i> (Wall. ex DC.) Wall. ex C.B. Clarke.	Asteraceae	Dicot	Herb	Annual	Unintentional	Invasive	Europe	13	II

<i>Lactucaorientalis</i> (Boiss.) Boiss.	Asteraceae	Dicot	Herb	Annual	Unintentiona l	Invasive	Europe	47	IVa
<i>Lactuca sativa</i> L.	Asteraceae	Dicot	Herb	Annual	Unintentiona l	Invasive	Europe	38	IVa
<i>Xanthium spinosum</i> L.	Asteraceae	Dicot	Herb	Perennia l	Unintentiona l	Invasive	Europe	25	III
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Dicot	Herb	Perennia l	Unintentiona l	Invasive	Europe	50	IVb
<i>Lactucadissecta</i> D.Don	Asteraceae	Dicot	Herb	Perennia l	Unintentiona l	Invasive	North America	62.3	V
<i>Xanthium strumarium</i> L.	Asteraceae	Dicot	Herb	Annual	Unintentiona l	Casual	South America	12	II
<i>Conyza canadensis</i> (L.)Cronquist	Asteraceae	Dicot	Herb	Annual	Unintentiona l	Invasive	Tibet	17	II
<i>Impatiens balsamina</i> L.	Balsaminaceae	Dicot	Herb	Annual	Unintentiona l	Naturalise d	Aisa	25	III
<i>Cuscutaplaniflora</i> Ten.	Convolvulaceae	Dicot	Parasiti c	Annual	Unintentiona l	Casual	Europe	11	II
<i>Carexsagaensis</i> y.C.Yang	Cyperaceae	Monoco t	Herb	Perennia l	Unintentiona l	Naturalise d	Europe	27	III
<i>Carexmicroglochin</i> Wahlenb.	Cyperaceae	Monoco t	Herb	Perennia l	Unintentiona l	Invasive	North America	63	V
<i>Carexatrofusca</i> Schkuhr.	Cyperaceae	Monoco	Herb	Perennia	Unintentiona	Naturalise	North	17	II

		t		l	l	d	America		
<i>Euphorbia hispida</i> Boiss.	Euphorbiaceae	Dicot	Herb	Perennial	Unintentional	Naturalised	Europe	26	III
<i>Euphorbia tibetica</i> Boiss.	Euphorbiaceae	Dicot	Herb	Perennial	Unintentional	Naturalised	Europe	20	II
<i>Juncus turkestanicus</i> Krecz. & Gontsch.	Juncaceae	Monocot	Herb	perennial	Unintentional	Naturalised	Europe	17	II
<i>Herminium monorchis</i> (L.) R.Br.	Orchidaceae	Monocot	Herb	Perennial	Unintentional	Naturalised	Europe Africa	14	II
<i>Epipactis helleborine</i> (L.) Crantz.	Orchidaceae	Monocot	Herb	Perennial	Unintentional	Casual	North America	11	II
<i>Phleum alpinum</i> L.	Poaceae	Dicot	Herb	Annual	Unintentional	Casual	Europe	12	II
<i>Piptatherum laterale</i> (Regel) Nevski.	Poaceae	Dicot	Herb	Annual	Unintentional	Casual	Europe	33	III
<i>Eragrostis hook</i> Host	Poaceae	Monocot	Herb	Perennial	Unintentional	Casual	Europe	54	IVa
<i>Puccinellia distans</i> (Jacquem.) Parl.	Poaceae	Monocot	Herb	Annual	Unintentional	Naturalized	Europe	33	II
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae	Dicot	Herb	Perennial	Unintentional	Invasive	Europe	65	V
<i>Poa tibetica</i> Munro ex Stapf in Hook. f.	Poaceae	Monocot	Herb	Perennial	Unintentional	Naturalised	Europe	39	III

<i>Poa annua</i> L.	Poaceae	Monocot	Herb	Annual	Unintentional	Invasive	North America	57	IVa
<i>Festuca rubra</i> L. subsp. rubra	Poaceae	Monocot	Herb	Perennial	Unintentional	Naturalised	South America	37	III
<i>Poa attenuata</i> Trin.	Poaceae	Monocot	Herb	perennial	Unintentional	Naturalised	Tropical America	26	III
<i>Polygonum abbreviatum</i> Kom.	Polygonaceae	Dicot	Herb	Annual	Unintentional	Naturalised	Europe	33	III
<i>Persicaria nepalensis</i> (Meisn.) Miyabe.	Polygonaceae	Dicot	Herb	Perennial	Unintentional	Invasive	Europe	57	V
<i>Polygonum rottboellioides</i> Jaub. & Spach.	Polygonaceae	Dicot	Herb	Perennial	Unintentional	Naturalised	Europe	51	III
<i>Rumex patientia</i> L.	Polygonaceae	Dicot	Herb	Perennial	Unintentional	Naturalised	Europe	32	III
<i>Potamogeton filiformis</i> Pers.	Potamogetonaceae	Dicot	Herb	Annual	Unintentional	Naturalised	Aisa temperate	9	II
<i>Potamogeton pamiricus</i> Baagoe.	Potamogetonaceae	Dicot	Herb	Annual	Unintentional	Naturalised	Aisa temperate	15	II
<i>Potamogeton crispus</i> L.	Potamogetonaceae	Dicot	Herb	Annual	Unintentional	Invasive	Europe	33	IVb
<i>Potamogeton nodosus</i> Poir.	Potamogetonaceae	Dicot	Herb	Annual	Unintentional	Naturalised	Europe	19	II

<i>Potamogeton perfoliatus</i> L.	Potamogetonaceae	Dicot	Herb	Annual	Unintentional	Naturalised	South America	24	II
<i>Clematis orientalis</i> L. “Tiktikama”	Ranunculaceae	Dicot	Herb	Perennial	Unintentional	Naturalised	Europe	27	III
<i>Ranunculus laetus</i> Wall. ex Hook. f. & Thomson	Ranunculaceae	Dicot	Herb	Perennial	Unintentional	Invasive	North America	46	IVb
<i>Galium tricornutum</i> Dandy	Rubiaceae	Dicot	Herb	Annual	Unintentional	Casual	Africa	18	II
<i>Galium boreale</i> L.	Rubiaceae	Dicot	Herb	Annual	Unintentional	Casual	Europe	16	II
<i>Galium serpylloides</i> Royle ex Hook. f.	Rubiaceae	Dicot	Herb	Annual	Unintentional	Casual	Europe	12	II
<i>Galium verum</i> L.	Rubiaceae	Dicot	Herb	Perennial	Unintentional	Casual	Europe	14	II
<i>Galium pauciflorum</i> Bunge	Rubiaceae	Dicot	Herb	Annual	Unintentional	Invasive	Europe	19	II
<i>Galium spurium</i> L.	Rubiaceae	Dicot	Herb	Annual	Unintentional	Invasive	Europe	59	V
<i>Datura stramonium</i> L.	Solanaceae	Dicot	Herb	Annual	Unintentional	Invasive	Europe	32	IVa

Table 8: Number of genera and species of alien flora of Ladakh belonging to different families

Family	No. of species	No. of Genra
Asteraceae	16	12
Poaceae	14	10
Amaranthaceae	10	5
Rubiaceae	6	1
Leguminaceae	5	3
Polygonaceae	5	3
Potamogetonaceae	5	1
Cyperaceae	3	1
Convolvulaceae	2	2
Euphorbiaceae	2	1
Iridaceae	2	1
Lamiaceae	2	1
Orchidaceae	2	2
Papaveraceae	2	1
Ranunculaceae	2	2
Salicaceae	2	2
Solanaceae	2	2
Adoxaceae	1	1
Balsaminaceae	1	1
Brassicaceae	1	1
Caryophyllaceae	1	1
Juncaceae	1	1

Moraceae	1	1
Portulacaceae	1	1
Total (24)	89	57

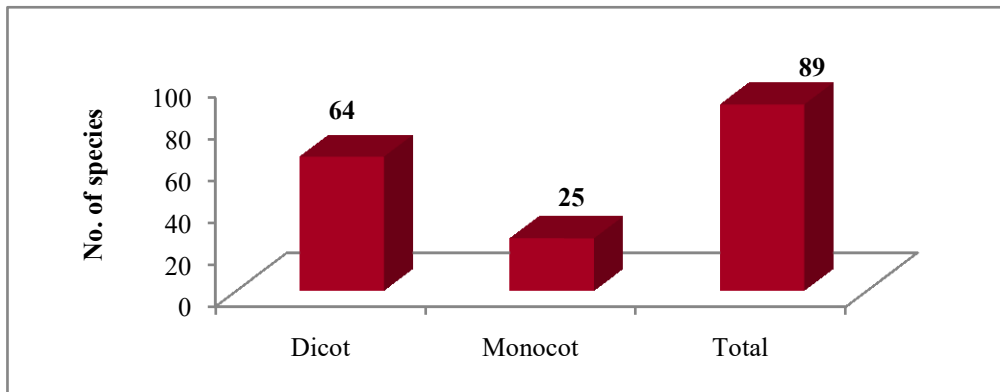


Fig.28: Number of alien species belonging to various taxonomic groups

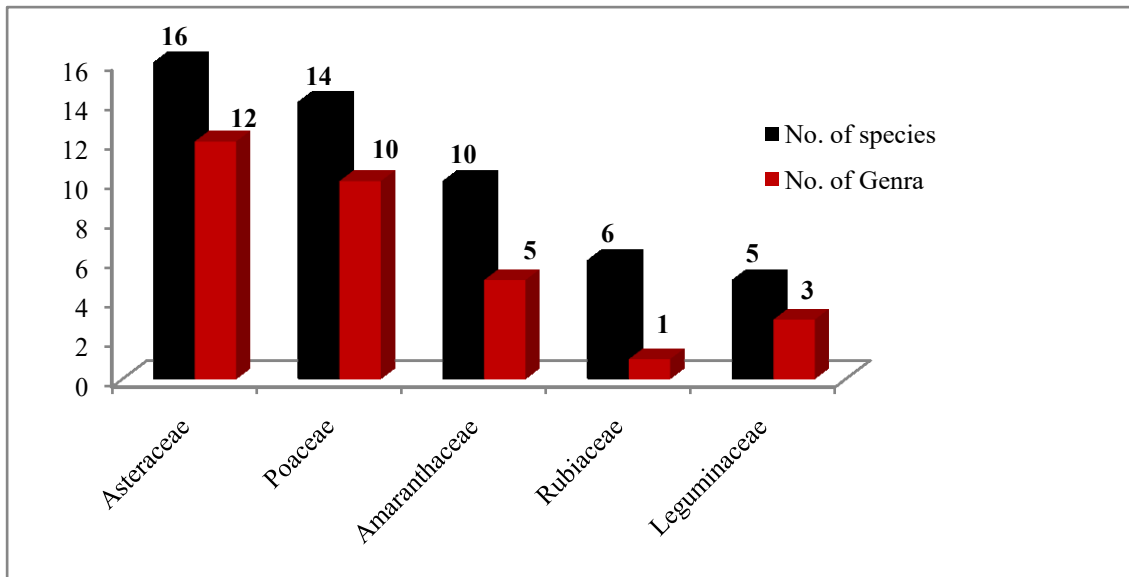


Fig. 29: Largest families of alien flora recorded in Ladakh

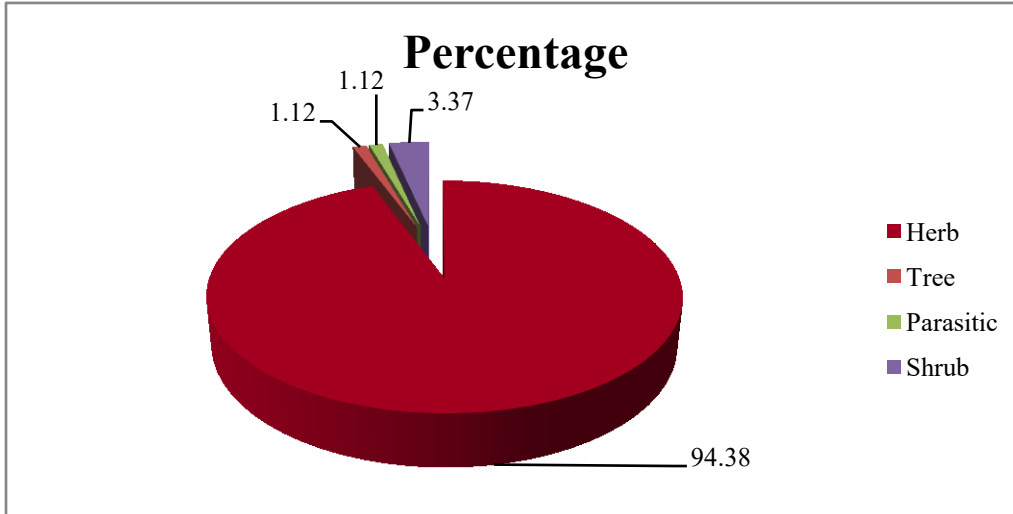


Fig.30: Percentage of various growth forms of alien flora recorded from Ladakh

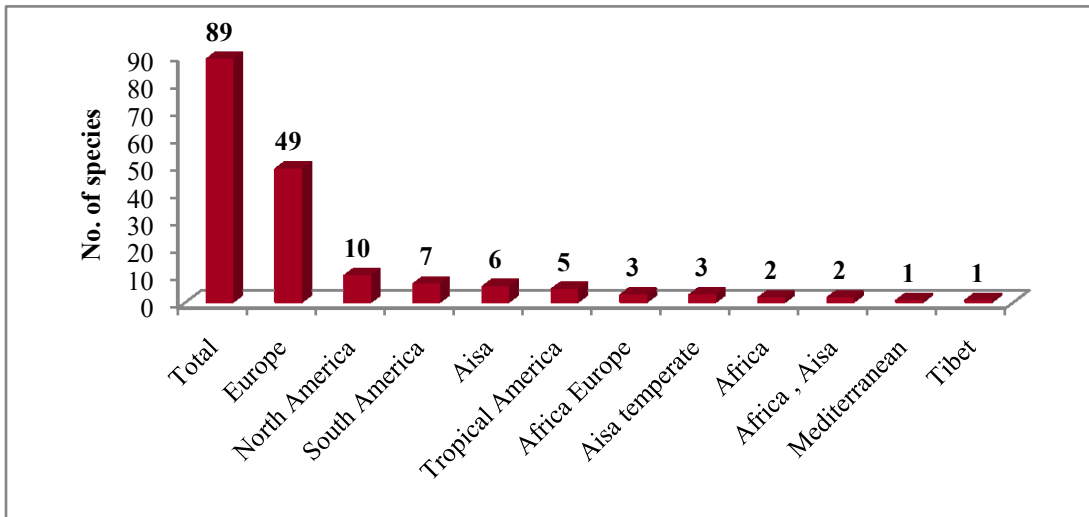


Fig. 31: Contribution of various biogeographical regions to the alien flora of Ladakh

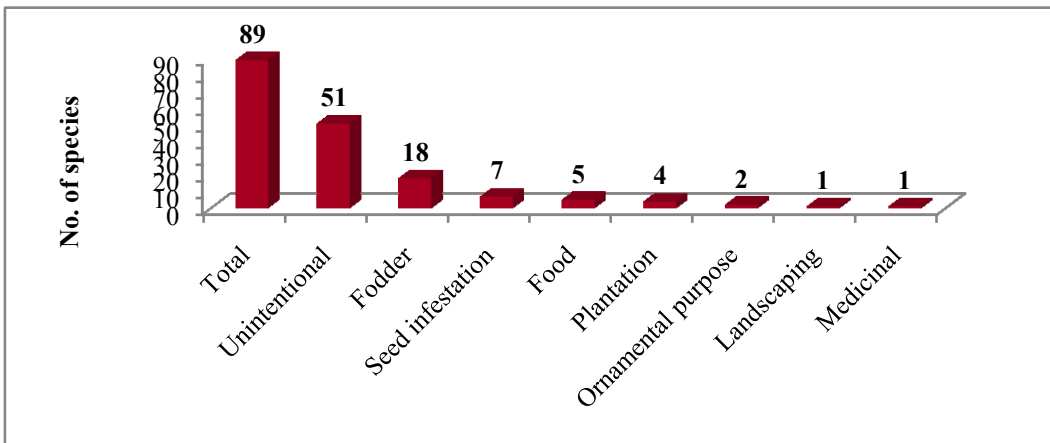


Fig. 32: Number of alien plant species and their purpose for introduction to Ladakh

Table 9: Top 10 invasive plant species of Ladakh region

S. NO.	Species	Frequency %	Density	Abundance
1.	<i>Lepyrodiclis holosteoides</i> C.A. Mey.) Fenzl ex Fisch. & C.A. Mey.	74	72.8	1426.67
2.	<i>Medicago falcata</i> L.	66	68.8	1191.11
3.	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	65	66.7	1780.00
4.	<i>Convolvulus arvensis</i> L.	65	65.6	1573.33
5.	<i>Carex microglochin</i> Wahlenb.	63	65.1	1677.78
6.	<i>Dysphania botrys</i> (L.) Mosyakin & Clemants.	63	64.8	1773.33
8.	<i>Chenopodium karoii</i> (Murr) Aellen	64	65	1455.56
9.	<i>Lactuca tatarica</i> (L.) C.A. Mey.	64	65.3	1600.00
10.	<i>Lactuca dissecta</i> D. Don	62.3	64.3	1586.67
10.	<i>Galium spurium</i> L.	59	58.6	1506.67

Table 10: Wide spread native plant species growing in Ladakh

S. No.	Species	Family	Plant Group	Growth form	Life span category	Frequency %	Density	Abundance
1	<i>Aconogonon tortuosum</i> (D. Don) Hara	Polygonaceae	Dicot	Herb	Perennial	55	26	194.76
2.	<i>Aconogonon rumicifolium</i> (Royle ex Bab.) Hara	Polygonaceae	Dicot	Herb	Perennial	45	19	1357.5
3.	<i>Melilotus officinalis</i> (L.) Desr. in Lam.	Leguminosae	Dicot	Herb	Annual	47	14.33	675.9
4.	<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	Dicot	Herb	Perennial	61	18.9	1417.5
5.	<i>Ajania fruticulosa</i> (Ledeb.) Poljak	Asteraceae	Dicot	Sub-shrub	Perennial	43	21.8	823.6
6.	<i>Artemisia persica</i> Bioss.	Asteraceae	Dicot	Herb	Perennial	41	26.3	1972.5
7.	<i>Cousinia thomsonii</i> C.B. Clarke	Asteraceae	Dicot	Herb	Perennial	51	15.2	1132.5
8.	<i>Arenaria bryophylla</i> Fernald	Caryophyllaceae	Dicot	Herb	Perennial	34	15.5	1162.5
9.	<i>Geranium himalayense</i> Klotzsch ex Hofmeist. & al.	Geraniaceae	Dicot	Herb	Perennial	56	25.4	1897.5
10.	<i>Christolea crassifolia</i> Camb. in Jacquem	Brassicaceae	Dicot	Herb	Perennial	45	11.5	862.5
11.	<i>Pedicularis bicornuta</i> Klotzsch	Orobanchaceae	Dicot	Herb	Perennial	49	18.8	1410
12.	<i>Potentilla multifida</i> L.	Rosaceae	Dicot	Herb	Perennial	64	15.2	1140
13.	<i>Lindelofia stylosa</i> (Kar. &Kir.) Brand	Boraginaceae	Dicot	Herb	Perennial	54	29.9	2180
14.	<i>Astragalus oplites</i> Benth. ex R. Parker	Leguminosae	Dicot	Sub-shrub	Perennial	34	15.4	750.7
15.	<i>Askellia flexuosa</i> (Ledeb.) W. A. Webber	Asteraceae	Dicot	Herb	Perennial	45	14.2	1132.5
16.	<i>Oxytropis microphylla</i> (Pall.) DC.	Leguminosae	Dicot	Herb	Perennial	52	13	1112.5
17.	<i>Ribes orientale</i> Desf.	Grossulariaceae	Dicot	Shrub	Perennial	55	25.5	1912.5
18.	<i>Menitskia tibetica</i> (Vatke) Krestovsk.	Lamiaceae	Dicot	Herb	Perennial	43	12.9	967.5
19.	<i>Rosa webbiana</i> Wall ex. Royle	Rosaceae	Dicot	Shrub	Perennial	58	18.9	1420
20.	<i>Caragana versicolor</i> Benth.	Leguminosae	Dicot	Shrub	Perennial	42	25.5	1912.5

Habitat wise invasion load in Ladakh region:

Though the vegetation of Ladakh is sparse with narrow habitable belts but at lower altitudinal belts the vegetation is lush where water is available. Ladakh also harbours the diverse habitats not only with respect altitudinal range but also with respect moisture and soil availability e.g., dry slopes, moist meadows, sand deposits, water bodies, rocy mountains, gravel areas, glacier moraines, saline soils etc.. The invasion load in different habitats in Ladakh region is described as under:

a. Moist and shady habitats

From the moist and shady habitats 78 plant species have been recorded in the present study from Ladakh (Table 11). These plant species belong to 61 genera in 25 families (Table 12). The largest families include: Leguminaceae (8 species), Asteraceae and Orobanchaceae (7 species each) (Table 12).

It has been observed in the present study that 74 species are herbs, 2 shrubs, and 2 trees. Majority of the plant species are perennial (60 species) followed by annuals 17 species) and 1 biennial.

Of the 78 plant species recorded 59 species are native and 19 are alien. Amongst the alien species 13 species are invasive and 6 species are naturalized (Table 11).

Table-11: Various plant species recorded from moist and shady habitats with different morphological features and nativity:

Plant Name	Family	Habit	Life Form	Nativity
<i>Taraxacum officinale</i> L.	Asteraceae	Herb	perennial	Invasive
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Herb	Perennial	Invasive
<i>Carex sagaensis</i> C.Yang	Cyperaceae	Herb	Perennial	Naturalized
<i>Carex stenophylla</i> Wahlenb.	Cyperaceae	Herb	Perennial	Invasive
<i>Euphorbia tibetica</i> Boiss.	Euphorbiaceae	Herb	Perennial	Naturalized
<i>Iris lactea</i> Pall.	Iridaceae	Herb	Perennial	Invasive
<i>Epilobium latifolium</i> L.	Onagraceae	Herb	Perennial	Naturalized
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Herb	Perennial	Naturalized
<i>Persicaria nepalensis</i> (Meisn.) Miyabe.	Polygonaceae	Herb	Perennial	Invasive
<i>Chenopodium album</i> L.	Amaranthaceae	Herb	Annual	Invasive

<i>Chenopodium glaucum</i> L.	Amaranthaceae	Herb	Annual	Invasive
<i>Dysphania botrys</i> (L.) Mosyakin&Clemants.	Amaranthaceae	Herb	Annual	Invasive
<i>Lactuca sativa</i> L.	Asteraceae	Herb	Annual	Naturalized
<i>Lactuca tatarica</i> (L.) C.A.Mey.	Asteraceae	Herb	Annual	Invasive
<i>Medicago falcata</i> L.	Leguminaceae	Herb	Perennial	Invasive
<i>Medicago lipulina</i> L	Leguminaceae	Herb	Perennial	Invasive
<i>Trifolium pratense</i> L.	Leguminaceae	Herb	Perennial	Invasive
<i>Trifolium repens</i> L.	Leguminaceae	Herb	Perennial	Invasive
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Herb	Perennial	Naturalized
<i>Verbascum thapsus</i> L.	Scrophulariaceae	Herb	Biennial	Native
<i>Seseli mucronatum</i> (Schrenk) Pimenov&Sdobnina	Apiaceae	Herb	Perennial	Native
<i>Atriplex pamirica</i> Iljin.	Amaranthaceae	Herb	Annual	Native
<i>Stellaria depressa</i> Em. Schmid	Caryophyllaceae	Herb	Annual	Native
<i>Thylacospermum caespitosum</i> (Camb.) Schischk.	Caryophyllaceae	Herb	Annual	Native
<i>Elsholtzia eriostachya</i> Bentham.	Lamiaceae	Herb	Annual	Native
<i>Oxytropis microphylla</i> (Pall.) DC.	Leguminaceae	Herb	Annual	Native
<i>Dactylorhiza hatagirea</i> (D.Don) Soó.	Orchidaceae	Herb	Annual	Native
<i>Pedicularislongiflora</i> Rudolph.	Orobanchaceae	Herb	Annual	Native
<i>Bromus pectinatus</i> Thunb.	Poaceae	Herb	Annual	Native
<i>Poa sikkimensis</i> (Stapf) Bor.	Poaceae	Herb	Annual	Native
<i>Ranunculus arvensis</i> L.	Ranunculaceae	Herb	Annual	Native
<i>Ranunculus longicaulis</i> Ledeb. ex A.Spreng.	Ranunculaceae	Herb	Annual	Native

<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	Herb	Perennial	Native
<i>Artemisia santolinifolia</i> Turcz. ex Besser.	Asteraceae	Herb	perennial	Native
<i>Cousiniathomsonii</i> C.B. Clarke	Asteraceae	Herb	Perennial	Native
<i>Crepidifolium tenuifolium</i> (Willd.) Sennikov.	Asteraceae	Herb	Perennial	Native
<i>Scorzonera virgata</i> DC.	Asteraceae	Herb	Perennial	Native
<i>Draba oreades</i> Schrenk.	Brassicaceae	Herb	Perennial	Native
<i>Ladakiellaklimesii</i> Al Shehbaz.	Brassicaceae	Herb	Perennial	Native
<i>Pegaeophytonscapiflorum</i> (Hook.f.& Thomson) Marq.& Shaw	Brassicaceae	Herb	Perennial	Native
<i>Silene nepalensis</i> Majumdar.	Caryophyllaceae	Herb	Perennial	Native
<i>Saginasaginoides</i> (L.) Karsten	Caryophyllaceae	Herb	Perennial	Native
<i>Stellaria irrigua</i> Bunge	Caryophyllaceae	Herb	Perennial	Native
<i>Geranium sibiricum</i>	Geraniaceae	Herb	Perennial	Native
<i>Dracocephalum heterophyllum</i> Benth.	Lamaiceae	Herb	Perennial	Native
<i>Melilotus officinalis</i> (L.) Pall.	Leguminosae	Herb	Perennial	Native
<i>Epilobium royleanum</i> Hausskn.	Onagraceae	Herb	Perennial	Native
<i>Pedicularispuncatata</i> L.	Orobanchaceae	Herb	Perennial	Native
<i>Pedicularis bicornuta</i> Klotzsch.	Orobanchaceae	Herb	Perennial	Native
<i>Pedicularis cheilanthifolia</i> Schrenk.	Orobanchaceae	Herb	Perennial	Native
<i>Pedicularispuncatata</i> L.	Orobanchaceae	Herb	Perennial	Native
<i>Pedicularis pyramidata</i> Royle ex Benth.	Orobanchaceae	Herb	Perennial	Native
<i>Parnassiapusilla</i> Wall.	Parnassiaceae	Herb	Perennial	Native
<i>Plantago depressa</i> Willd.	Plantaginaceae	Herb	Perennial	Native
<i>Plantago himalaica</i>	Plantaginaceae	Herb	Perennial	Native

<i>Aconogonontortuosum</i> (D.Don) H.Hara.	Polygonaceae	Herb	Perennial	Native
<i>Rumex angulatus</i> Rech. f.	Polygonaceae	Herb	Perennial	Native
<i>Koenigiaislandica</i> L.	Polygonaceae	Herb	Perennial	Native
<i>Knorringiapamirica</i>	Polygonaceae	Herb	Perennial	Native
<i>Aconitum violaceum</i> Jacquem. ex Stapf.	Ranunculaceae	Herb	Perennial	Native
<i>Ranunculus natans</i> C.A.Mey.	Ranunculaceae	Herb	Perennial	Native
<i>Delphinium cashmerianum</i> Royle.	Ranunculaceae	Herb	Perennial	Native
<i>Halerpestessarmentosa</i> Kom.	Ranunculaceae	Herb	Perennial	Native
<i>Argentina anserina</i> (L.) Rydb.	Rosaceae	Herb	Perennial	Native
<i>Urtica dioecia</i> L.	Urticaceae	Herb	Perennial	Native
<i>Astragalus oplites</i> Benth. ex R. Parker.	Leguminaceae	Shrub	Perennial	Native
<i>Salix pycnostachya</i> Anderson.	Salicaceae	Shrub	Perennial	Native
<i>Salix sericocarpa</i> Andersson	Salicaceae	tree	perennial	Native
<i>Populus pamirica</i> Kom.	Salicaceae	tree	perennial	Native
<i>Heracleum pinnatum</i> C.B. Clarke	Apiaceae	Herb	Perennial	Native
<i>Lindelofia stylosa</i> (Kar. &Kir.) Brand	Boraginaceae	Herb	Perennial	Native
<i>Geranium himalayense</i> Klotzsch	Geraniaceae	Herb	Perennial	Native
<i>Mentha royleana</i> Wall. ex Benth.	Lamiaceae	Herb	Perennial	Native
<i>Stachys tibetica</i> Vatke.	Lamiaceae	Herb	Perennial	Native
<i>Mentha royleana</i> Wall. ex Benth.	Lamiaceae	Herb	Perennial	Native
<i>Lanceatibetica</i> Hook .F.	Plantaginaceae	Herb	Perennial	Native
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Herb	Perennial	Native

Table 12: Number of genera and species belonging to different families growing in moist and shady habitats

Family	No. of genera	No. of species
Amaranthaceae	3	4
Apiaceae	2	3
Asteraceae	7	7
Boraginaceae	1	1
Brassicaceae	3	3
Caryophyllaceae	5	6
Convolvulaceae	1	1
Cyperaceae	1	2
Euphorbiaceae	1	1
Geraniaceae	1	2
Iridaceae	1	1
Lamiaceae	5	5
Leguminaceae	6	8
Onagraceae	2	2
Orchidaceae	1	1
Orobanchaceae	2	7
Parnassiaceae	1	1
Poaceae	3	3
Polygonaceae	5	6
Ranunculaceae	4	6
Salicaceae	2	3
Scrophulariaceae	1	1
Urticaceae	1	1

Plantaginaceae	2	3
Total 25	61	78

b. Sandy habitats (sand deposits)

From such habitats 12 plant species have been recorded till date (Table 13). These plant species belong to 10 genera in 7 families. Asteraceae is the largest family with 8 species (Table 13).

Present study revealed that 9 species are herbs, 2 shrubs, and 1 tree. Majority of the plant species are perennial (8 species) followed by annuals 4 species) and 1 biannual.

Of the 12 plant species recorded 8 species are native and 4 are alien. Amongst the alien species 3 species are invasive and 1 species is casual (Table 13).

Table13: Plant species recorded from sandy habitats with different morphological features and nativity:

Plant Name	Family	Growth form	Life cycle	Nativity
<i>Halogeton arachnoideus</i> Moq.	Amaranthaceae	Herb	Annual	Casual
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Herb	Perennial	Invasive
<i>Lactuca sativa</i> L.	Asteraceae	Herb	Annual	Invasive
<i>Lactuca tatarica</i> (L.) C.A.Mey.	Asteraceae	Herb	Annual	Invasive
<i>Echinops cornigerus</i> DC.	Asteraceae	Herb	Annual	Native
<i>Artemisia stricta</i> Edgew.	Asteraceae	Herb	Perennial	Native
<i>Artemisia stracheyi</i> Hook.f. & Thomson ex C.B.Clarke.	Asteraceae	Herb	Perennial	Native
<i>Piptatherum gracile</i> Mez	Poaceae	Herb	Perennial	Native
<i>Cynanchum acutum</i> L.	Apocynaceae	Herb	Perennial	Native
<i>Hippophaerhamnoides</i> L.	Elaeagnaceae	Shrub	Perennial	Native
<i>Lycium ruthenicum</i> Murray	Solanaceae	Shrub	Perennial	Native
<i>Myricaria germanica</i> (L.) Desv.	Tamaricaceae	Tree	Perennial	Native

c. Wheat fields

From the wheat fields of Ladakh 53 plant species have been recorded (Table 14). These plant species belong to 35 genera in 19 families. The largest families include: Asteraceae (8 species), Amaranthaceae (8 species) and Caryophyllaceae (5 species each (Table 15).

It has been observed in the present study that 51 species are herbs, and 2 shrubs. Majority of the plant species are perennial (34 species) followed by annuals (19 species).

Of the 52 plant species recorded 31 species are native and 21 are alien. Amongst the alien species 12 species are invasive, 4 casual and 5 species are naturalized (Table 14).

Table 14: Plant species recorded from wheat fields with different morphological features and nativity

Name of Plants	Family	Growth form	Life cycle	Alien Category
<i>Dysphania tibetica</i> Uotila	Amaranthaceae	Herb	Annual	Casual
<i>Epipactis helleborine</i> (L.) Crantz.	Orchidaceae	Herb	Perennial	Casual
<i>Galium boreale</i> L.	Rubiaceae	Herb	Annual	Casual
<i>Galium pauciflorum</i> Bunge	Rubiaceae	Herb	Annual	Casual
<i>Chenopodium album</i> L.	Amaranthaceae	Herb	Annual	Invasive
<i>Chenopodium ambrosioides</i> L.	Amaranthaceae	Herb	Perennial	Invasive
<i>Chenopodium glaucum</i> L.	Amaranthaceae	Herb	Annual	Naturalised
<i>Chenopodium karoii</i> (Murr) Aellen	Amaranthaceae	Herb	Annual	Invasive
<i>Dysphania botrys</i> (L.) Mosyakin & Clemants.	Amaranthaceae	Herb	Annual	Invasive
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Herb	Annual	Naturalised
<i>Lactuca dissecta</i> D. Don	Asteraceae	Herb	Perennial	Invasive
<i>Lactuca tatarica</i> (L.) C.A. Mey.	Asteraceae	Herb	Annual	Invasive
<i>Lepyrodia clisholosteoidea</i> (C.A. Mey.) Fenzl ex Fisch. & C.A.	Caryophyllaceae	Herb	Annual	Invasive

Mey.				
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Herb	Perennial	Invasive
<i>Iris lactea</i> Pall.	Iridaceae	Herb	Perennial	Invasive
<i>Epilobium latifolium</i> L.	Onagraceae	Herb	Perennial	Naturalised
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae	Herb	Perennial	Invasive
<i>Galium spurium</i> L.	Rubiaceae	Herb	Annual	Invasive
<i>Solanum nigrum</i> L.	Solanaceae	Herb	Annual	Naturalised
<i>Medicago lupulina</i> L.	Leguminaceae	Herb	Perennial	Naturalized
<i>Medicago falcata</i> L.	Leguminosae	Herb	Perennial	Invasive
<i>Atriplex schugnanica</i> Jjin	Amaranthaceae	Herb	Annual	Native
<i>Chenopodium foliosum</i> (Moench) Ascherson.	Amaranthaceae	Herb	Annual	Native
<i>Heracleum candicans</i> Wall. ex DC.	Apiaceae	Herb	Perennial	Native
<i>Achillea millefolium</i> L.	Asteraceae	Herb	Perennial	Native
<i>Artemisia santolinifolia</i> Turcz. ex Besser.	Asteraceae	Herb	perennial	Native
<i>Artemisia tournefortiana</i> Rchb.	Asteraceae	Herb	Perennial	Native
<i>Centaurea depressa</i> M. Bieb.	Asteraceae	Herb	Annual	Native
<i>Nepeta discolor</i> Benth	Asteraceae	Herb	Perennial	Native
<i>Descurainia sophia</i> Webb.	Brassicaceae	Herb	annual	Native
<i>Silene gonosperma</i> (Rupr.) Bocquet.	Caryophyllaceae	Herb	Perennial	Native
<i>Silene himalayensis</i> (Rohrb.) Majumdar.	Caryophyllaceae	Herb	Perennial	Native
<i>Silene nepalensis</i> Majumdar.	Caryophyllaceae	Herb	Perennial	Native
<i>Silene moorcroftiana</i> Wall. ex Benth. in Royle.	Caryophyllaceae	Herb	Perennial	Native
<i>Geranium himalayense</i> Klotzsch.	Geraniaceae	Herb	Perennial	Native
<i>Elsholtzia densa</i> Benth.	Lamiaceae	Herb	Annual	Native
<i>Mentha longifolia</i> Benth. in Wall.	Lamiaceae	Herb	Perennial	Native

<i>Mentha royleana</i> Wall. ex Benth.	Lamiaceae	Herb	Perennial	Native
<i>Stachys tibetica</i> Vatke.	Lamiaceae	Herb	Perennial	Native
<i>Medicago lupulina</i> L.	Leguminaceae	Herb	Perennial	Native
<i>Melilotus officinalis</i> (L.) Pall.	Leguminaceae	Herb	Perennial	Native
<i>Epilobium angustifolium</i> L.	Onagraceae	Herb	Perennial	Native
<i>Plantago depressa</i> Willd.	Plantaginaceae	Herb	Perennial	Native
<i>Elymus jacquemontii</i> Tzvelev	Poaceae	Herb	Perennial	Native
<i>Knorringiapamirica</i>	Polygonaceae	Herb	Perennial	Native
<i>Polygonum orientale</i> L.	Polygonaceae	Herb	Perennial	Native
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Herb	Perennial	Native
<i>Ranunculus arvensis</i> L.	Ranunculaceae	Herb	Annual	Native
<i>Thalictrum alpinum</i> L.	Ranunculaceae	Herb	Perennial	Native
<i>Thalictrum platycarpum</i> Hook.f. & Thomson	Ranunculaceae	Herb	Annual	Native
<i>Clematis orientalis</i> L.	Ranunculaceae	Shrub	Perennial	Native
<i>Rosa webbiana</i> Wall. ex Royle	Rosaceae	Shrub	perennial	Native
<i>Medicago sativa</i> L.	Leguminaceae	Herb	Perennial	Native

Table 15: Number of genera and species belonging to different families growing in wheat fields

Family	No. of Genra	No. of Species
Amaranthaceae		
Apiaceae	3	8
Asteraceae	1	1

Brassicaceae	6	8
Caryophyllaceae	1	1
Convolvulaceae	2	5
Geraniaceae	1	1
Iridaceae	1	1
Lamiaceae	1	1
Leguminaceae	3	4
Onagraceae	2	5
Orchidaceae	1	2
Plantaginaceae	1	1
Poaceae	1	1
Polygonaceae	1	2
Ranunculaceae	3	3
Rosaceae	4	4
Rubiaceae	1	1
Solanaceae	1	3

d. Raparine habitats

From such habitats 33 plant species have been recorded in the present study from Ladkh (Table 16). These plant species belong to 28 genera in 15 families (Table 16). The largest families include: Leguminaceae (8 species), Asteraceae and Orobanchaceae (7 species each (Table 17).

Amongst the recorded 33 species 27 species are herbs, 2 shrubs, and 2 sub-shrubs. Majority of the plant species are perennial (24 species) followed by annuals 8 species) and 1 biannual.

Of the 33 plant species recorded 26 species are native and 7 are alien. Amongst the alien species 4 species are invasive, 2 species naturalized and 1 species is casual (Table 17).

Table 16: Plant species recorded from Raparine habitats

Plant name	Family	Growth form	Life cycle	Nativity
<i>Halogeton arachnoideus</i> Moq.	Amaranthaceae	Herb	Annual	Casual
<i>Taraxacum officinale</i> L.	Asteraceae	Herb	perennial	Invasive
<i>Cirsium arvense</i> (L.) Scop.	Asteraceae	Herb	Perennial	Invasive
<i>Iris lactea</i> Pall.	Iridaceae	Herb	Perennial	Invasive
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Herb	Perennial	Invasive
<i>Trifolium repens</i> L.	Leguminosae	Herb	Perennial	Naturalized
<i>Poa annua</i> L.	Poaceae	Herb	Annual	Naturalized
<i>Plantago lanceolata</i> L.	Plantaginaceae	Herb	Perennial	Native
<i>Kochia scoparia</i> (L.) Schrad.	Amaranthaceae	Herb	Annual	Native
<i>Kochia stellaris</i> Moq.	Amaranthaceae	Herb	Annual	Native
<i>Bassia prostrata</i> (L.) Beck.	Amaranthaceae	Sub shrub	Annual	Native
<i>Krascheninnikoviaceratoides</i> (L.) Gueldenst.	Amaranthaceae	Herb	Perennial	Native
<i>Krascheninnikoviapungens</i> (Pazij) Podlech	Amaranthaceae	Herb	Perennial	Native
<i>Salsola kali</i> subsp. <i>tragus</i> (L.) Čelak.	Amaranthaceae	Herb	Perennial	Native
<i>Haloxylon thomsonii</i> Bunge ex Bois	Amaranthaceae	Sub shrub	Perennial	Native
<i>Artemisia santolinifolia</i> Turcz. ex Besser.	Asteraceae	Herb	perennial	Native
<i>Arabis tibetica</i> Hook. f. & Thomson	Brassicaceae	Herb	Biennial	Native

<i>Thylacospermum caespitosum</i> (Camb.) Schischk.	Caryophyllaceae	Herb	Annual	Native
<i>Hippophae ramnoides</i> L.	Elaeagnaceae	Shrub	Perennial	Native
<i>Pervoskia abrotanoides</i> Kar.	Lamaiceae	Herb	Perennial	Native
<i>Astragalus tribulifolius</i> Benth. ex Bunge	Leguminaceae	Herb	Perennial	Native
<i>Astragalus oplites</i> Benth. ex R. Parker.	Leguminaceae	Shrub	Perennial	Native
<i>Caragana versicolor</i> Benth.	Leguminaceae	Shrub	Perennial	Native
<i>Oxytropis tatarica</i> Baker.	Leguminaceae	Shrub	Perennial	Native
<i>Hypecoum leptocarpum</i> J. D. Hooker & Thomson.	Papaveraceae	Herb	Annual	Native
<i>Corydalis flabellata</i> Edgeworth.	Papaveraceae	Herb	Perennial	Native
<i>Corydalis moorcroftiana</i> Wall. ex Hook. f. & Thomson.	Papaveraceae	Herb	Perennial	Native
<i>Plantago major</i> L.	Plantaginaceae	Herb	Perennial	Native
<i>Poa alpina</i> L.	Poaceae	Herb	Annual	Native
<i>Poa calliopsis</i> Litw.	Poaceae	Herb	perennial	Native
<i>Androsace baltistanica</i> Y. J. Nasir.	Primulaceae	Herb	Perennial	Native
<i>Comarum salesovianum</i> (Steph.) Ascherson & Graebner	Rosaceae	Herb	Perennial	Native
<i>Scrophularia dentata</i> Royle ex Benth.	Scrophulariaceae	Herb	Perennial	Native

Table 17: Number of genera and species belonging to different families growing in Raparine habitats

Family	No. of Genra	No. of species
Amaranthaceae	6	8
Asteraceae	3	3
Brassicaceae	1	1

Caryophyllaceae	1	1
Elaeagnaceae	1	1
Iridaceae	1	1
Lamaiceae	4	1
Leguminosae	3	5
Papaveraceae	2	3
Plantaginaceae	1	2
Poaceae	1	3
Polygonaceae	1	1
Primulaceae	1	1
Rosaceae	1	1
Scrophulariaceae	1	1

e. Mountain slopes

From mountain slopes 51 plant species have been recorded in the present study from Ladkh (Table 18). These plant species belong to 40 genera in 14 families. The largest families include: Asteraceae (819 species), Boraginaceae and Brassicaceae (6 species each (Table 19).

Amongst the recorded 51 species 45 species are herbs, 5 shrubs, and 1 sub-shrub. Majority of the plant species are perennial (41 species) followed by annuals 8 species) and 2 biannual.

Of the 51 plant species recorded 47 species are native and 4 are alien. Amongst the alien species all the 4 species are invasive (Table 18).

Table18: Plant species recorded from sloppy habitats with different morphological features and nativity

Plant Name	Family	Habit	Life Form	Nativity
<i>Lactucataratarica</i> (L.) C.A.Mey	Asteraceae	Herb	Annual	Invasive
<i>Medicago falcata</i> L.	Leguminosae	Herb	Perennial	Invasive
<i>Eritrichiumfruticulosum</i> Klotzsch.	Boraginaceae	Herb	Perennial	Invasive
<i>Artemisia fragrans</i> Willd.	Asteraceae	Herb	Perennial	Invasive
<i>Allium areoprasum</i> L.	Lilliaceae	Herb	Perennial	Native
<i>Atriplex schugnanica</i> Iljin.	Amaranthaceae	Herb	Annual	Native
<i>Axyrishybrida</i> L.	Amaranthaceae	Herb	Annual	Native
<i>Semenovialasiocarpa</i> (Boiss.) Manden.	Apiaceae	Herb	Annual	Native
<i>Brachyactispubescens</i> (DC.) Aitch. &C.B.Clarke.	Asteraceae	Herb	Annual	Native
<i>Koelpinia linearis</i> Pall.	Asteraceae	Herb	Annual	Native
<i>Askelliananiformis</i> (Babc.) Sennikov	Asteraceae	Herb	Annual	Native
<i>Elsholtziaeriostachya</i> Bentham.	Lamaiceae	Herb	Annual	Native
<i>Mattiastrumhimalayense</i> (Klotzsch) Brand.	Boraginaceae	Herb	Biennial	Native
<i>Arabis tibetica</i> Hook.f. & Thomson	Brassicaceae	Herb	Biennial	Native
<i>Krascheninnikoviapungens</i> (Pazij) Podlech	Amaranthaceae	Herb	Perennial	Native
<i>Salsola jacquamontii</i> Moq.	Amaranthaceae	Herb	Perennial	Native
<i>Allium carolinianum</i> DC.	Amaryllidaceae	Herb	Perennial	Native
<i>Anaphalisnubigena</i> DC.	Asteraceae	Herb	Perennial	Native
<i>Artemisia persica</i> Boiss.	Asteraceae	Herb	Perennial	Native
<i>Artemisia salsoloides</i> Willd.	Asteraceae	Herb	Perennial	Native
<i>Artemisia santolinifolia</i> Turcz. ex Besser.	Asteraceae	Herb	perennial	Native

<i>Aster flaccidus</i> Bunge.	Asteraceae	Herb	Perennial	Native
<i>Inularhizocephala</i> Schrenk.	Asteraceae	Herb	Perennial	Native
<i>Leontopodium ochroleucum</i> Beauverd.	Asteraceae	Herb	Perennial	Native
<i>Richteriapyrethroides</i> Kar. &Kir.	Asteraceae	Herb	Perennial	Native
<i>Scorzonera virgata</i> DC.	Asteraceae	Herb	Perennial	Native
<i>Waldheimia tomentosa</i> (Decne.) Regel.	Asteraceae	Herb	Perennial	Native
<i>Heteropappossemiprostratus</i> Grierson.	Asteraceae	Herb	Perennial	Native
<i>Hippolytiasenecionis</i> Tzvelev.	Asteraceae	Herb	Perennial	Native
<i>Psychrogetonandryaloides</i> DC.	Asteraceae	Herb	Perennial	Native
<i>Arnebiaeuchroma</i> (Royle) I.M.Johnst.	Boraginaceae	Herb	Perennial	Native
<i>Arnebia guttata</i> Bunge.	Boraginaceae	Herb	Perennial	Native
<i>Eritrichiumspathulatum</i> (Benth. in Royle) C.B.Clarke	Boraginaceae	Herb	Perennial	Native
<i>Saussurea glacialis</i> Herder.	Brassicaceae	Herb	Perennial	Native
<i>Drabaaltaica</i> Bunge.	Brassicaceae	Herb	Perennial	Native
<i>Drabacachemirica</i> Gand.	Brassicaceae	Herb	Perennial	Native
<i>Draba glomerata</i> Royle.	Brassicaceae	Herb	Perennial	Native
<i>Drabahimachallensis</i> Al Shehbaz.	Brassicaceae	Herb	Perennial	Native
<i>Thymus linearis</i> Benth.	Lamiaceae	Herb	Perennial	Native
<i>Astragalus nivalis</i> Kar. &Kir.	Leguminaceae	Herb	Perennial	Native
<i>Poa attenuata</i> Trin.	Poaceae	Herb	perennial	Native
<i>Aconogonontortuosum</i> (D.Don) H.Hara.	Polygonaceae	Herb	Perennial	Native
<i>Androsacerobusta</i> (R.Knuth) Hand.- Mazz.	Primulaceae	Herb	Perennial	Native
<i>Chamaerhodossabulosa</i> Bunge in Ledeb.	Rosaceae	Herb	Perennial	Native
<i>Ribes orientale</i> Desf.	Grossulariaceae	shrub	Perennial	Native

<i>Astragalus munroi</i> Bunge.	Leguminaceae	shrub	Perennial	Native
<i>Astragalus oplites</i> Benth. ex R. Parker.	Leguminaceae	Shrub	Perennial	Native
<i>Astragalus rhizanthus</i> Royle ex Benth. in Royle.	Leguminaceae	Shrub	Perennial	Native
<i>Dasiphoradryadanthoides</i> Juz.	Rosaceae	Shrub	Perennial	Native
<i>Tanacetum stoliczkae</i> (C.B. Clarke) R.Khan	Asteraceae	Sub shrub	Perennial	Native
<i>Lindelofia stylosa</i> (Kar. & Kir.) Brand	Boraginaceae	Herb	Perennial	Native

Table 19: Number of genera and species belonging to different families growing in slopes

Family	No. of genera	No. of species
Asteraceae	16	19
Boraginaceae	4	6
Brassicaceae	3	6
Amaranthaceae	4	4
Leguminaceae	2	5
Lamiaceae	2	2
Rosaceae	2	2
Amaryllidaceae	1	1
Apiaceae	1	1
Grossulariaceae	1	1
Liliaceae	1	1
Poaceae	1	1
Polygonaceae	1	1

Primulaceae	1	1
Total 14	40	51

(2). Invasion load in Kashmir region of J&K: During the present study 173 alien plant species have been collected from Kashmir region till date. These plant species belong to 124 genera in 37 families. Of these 137 species are dicots and 36 species are monocot (Table 20). The largest families include: Asteraceae (35 species), Poaceae (22 species), Brassicaceae (14 species), Leguminaceae (10 species) and Polygonaceae (8 species) (Fig.33).

Present study revealed that 160 alien species are herbs, 9 shrubs, 2 sub-shrubs and 2 trees. The percentage composition of these life forms is given in Fig. 34. Majority of these alien plant species are perennial (93 species) followed by annuals (64 species) and biannuals (15 species) (Fig.35).

Of the 173 alien species 93 species are invasive, 23 species are casual, 53 species are naturalized and 4 species are ornamental. The proportion of invasive, casual and ornamental species is depicted in Fig. 36.

The present study revealed that native distributional range of majority of these alien species is Europe followed by North American species (Fig. 37). It has also been recorded in the present study that purpose of introduction of majority of the alien species (130 spp.) were unintentionally in this region, followed by fodder (26 spp.), and ornamental (10 spp.) and least (1 species) have been introduced for landscaping and plantation (Fig.38).

According to the invasion criteria followed in the present study most of the naturalized species (107 species) fall in stage 'II' of invasion, 17 species in stage 'III', 14 species in 'IVa' stage, 3 species in 'IVb', and 5 species in stage 'V' of invasion. The five invasive species of Kashmir region is depicted in Table 21.

Alien plant species recorded from Kashmir region with different morphological and ecological attributes

Plant Name	Family	Plant Group	Growth form	Life cycle	Mode of introduction	Alien Category	Nativity	Frequency %	Invasion Stage
<i>Achyranthes aspera</i> L. var. pubescens	Amaranthaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	11	II
<i>Agrimonia eupatoria</i> L.	Rosaceae	Dicot	Herb	Perennial	Casual	Europe	Unintentional	16	II
<i>Amaranthus cruentus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Invasive	South America	Fodder	18	II
<i>Amaranthus graecizans</i> L.	Amaranthaceae	Dicot	Herb	Annual	Invasive	Europe	Fodder	32	II
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Dicot	Herb	Annual	Invasive	Europe	Fodder	37	III
<i>Amaranthus tricolor</i> L.	Amaranthaceae	Dicot	Herb	Annual	Invasive	Africa	Fodder	13	II
<i>Anagalis arvensis</i> L.	Primulaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	13	II
<i>Anthemis cotula</i> L.	Asteraceae	Dicot	Herb	Biennial	Invasive	Europe	Unintentional	69.5	v
<i>Arctium lappa</i> L.	Asteraceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	12	II
<i>Arenaria serpyllifolia</i> L.	Caryophyllaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	13	II

	ae						al		
<i>Artemisia absinthium</i> L.	Asteraceae	Dicot	Herb	Perennial	Naturalised	North America	Medicinal	52.3	IV
<i>Artemisia dracunculus</i> L.	Asteraceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	16	II
<i>Aster pilosus</i> Willd.	Asteraceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	18	II
<i>Bellis perennis</i> L.	Asteraceae	Dicot	Herb	Annual	Ornamental	Europe	Ornamental	22	III
<i>Bidens chinensis</i> Willd.	Asteraceae	Dicot	Herb	Perennial	Invasive	North America	Unintentional	11	II
<i>Bidens tripartita</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	30	III
<i>Brassica napus</i> L.	Brassicaceae	Dicot	Herb	Annual	Invasive	Europe	Fodder	12	II
<i>Brassica nigra</i> Koch	Brassicaceae	Dicot	Herb	Biennial	Cultivated	Europe	Fodder	11	II
<i>Brassica oleracea</i> L. var. <i>gongylodes</i> L.	Brassicaceae	Dicot	Herb	Biennial	Cultivated	Europe	Fodder	18	III
<i>Butomus umbellatus</i> L.	Brassicaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	33	III
<i>Calendula officinalis</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	North America	Ornamental	23	III
<i>Cannabis sativa</i> L.	Cannabaceae	Dicot	Herb	Perennial	Invasive	North America	Unintentional	55	IV

<i>Carduus edelbergii</i> Rech. f.	Asteraceae	Dicot	Herb	Biennial	Invasive	Europe	Unintentional	37	III
<i>Carpesiumabrotanoides</i> L	Asteraceae	Dicot	Herb	Perennial	Invasive	South America	Unintentional	16	II
<i>Centaurea iberica</i> Trevir. ex Spreng.	Asteraceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	64	V
<i>Cerastiumglomeratum</i> Thuill.	Caryophyllaceae	Dicot	Herb	Annual	Naturalised	North America	Unintentional	16	II
<i>Ceratophyllumdemersum</i> L.	Ceratophyllaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	33	III
<i>Cheiranthus cheiri</i> L.	Brassicaceae	Dicot	Herb	Perennial	Casual	Europe	Unintentional	31	III
<i>Chenopodium album</i> L.	Amaranthaceae	Dicot	Herb	Annual	Invasive	Africa	Unintentional	27	III
<i>Chenopodium foliosum</i> Aschers.	Chenopodiaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	25	III
<i>Chenopodium hybridum</i> L.	Chenopodiaceae	Dicot	Herb	Perennial	Invasive	Europe	Fodder	39	IV
<i>Chenopodium murale</i> L.	Chenopodiaceae	Dicot	Herb	Perennial	Naturalised	Africa	Fodder	13	II
<i>Cirsium wallichii</i> DC.	Asteraceae	Dicot	Herb	Biennial	Invasive	Europe	Unintentional	39	IV
<i>Clinopodiumumbrosum</i> C.	Lamiaceae	Dicot	Herb	Perennial	Naturalised	Europe	Unintentional	49	IV

Koch							al		
<i>Clinopodium vulgare</i> L.	Lamiaceae	Dicot	Herb	Perennial	Naturalised	South America	Unintentional	18	II
<i>Conium maculatum</i> L.	Apiaceae	Dicot	Herb	Perennial	Invasive	Europe	Fodder	64	IV
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	52.3	IV
<i>Convolvulus falcatus</i> L.	Convolvulaceae	Dicot	Herb	Perennial	Casual	Europe	Unintentional	54	IV
<i>Conyza bonariensis</i> Cronquist	Asteraceae	Dicot	Herb	Annual	Cs	Europe	Unintentional	44	IV
<i>Conyza canadensis</i> Cronquist	Asteraceae	Dicot	Herb	Biennial	Invasive	North America	Unintentional	12	II
<i>Conyza sumatrensis</i> (S.F.Blake) Pruski&G.Sancho	Asteraceae	Dicot	Herb	Annual	Invasive	North America	Unintentional	16	II
<i>Crepis sancta</i> Babc.	Asteraceae	Dicot	Herb	Annual	Invasive	Aisa	Unintentional	11	II
<i>Cynoglossum lanceolatum</i> F orssk	Boraginaceae	Dicot	Herb	Biennial	Casual	Europe	Unintentional	32	IV
<i>Datura innoxia</i> Mill.	Solanaceae	Dicot	Herb	Annual	Casual	South America	Unintentional	45	IVA
<i>Datura meteloides</i> Dunal	Solanaceae	Dicot	Herb	Perennial	Casual	South America	Unintentional	13	II

<i>Datura stramonium</i> L.	Solanaceae	Dicot	Herb	Annual	Invasive	North America	Unintentional	17	II
<i>Epilobium hirsutum</i> L.	Onagraceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	18	II
<i>Erigeron annuus</i> Pers.	Asteraceae	Dicot	Herb	Annual	Casual	North America	Unintentional	18	II
<i>Erigeron pulchellus</i> Michx.	Asteraceae	Dicot	Herb	Annual	Cs	North America	Unintentional	17	II
<i>Eryngium billardieri</i> Del.	Apiaceae	Dicot	Herb	Perennial	Invasive	South America	Unintentional	15	II
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	17	II
<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	Dicot	Herb	Annual	Naturalised	South America	Unintentional	54	V
<i>Filago arvensis</i> L.	Asteraceae	Dicot	Herb	Annual	Naturalised	Europe	Unintentional	18	v
<i>Fragaria nubicola</i> Lindel. ex Lacaíta	Rosaceae	Dicot	Herb	Perennial	Naturalised	South America	Unintentional	17	II
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	64	IVB
<i>Galium aparine</i> L.	Rubiaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	55	IVB
<i>Galium palustre</i> L.	Rubiaceae	Dicot	Herb	Perennial	Naturalised	Europe	Unintentional	21	III

							al		
<i>Geumurbanum</i> L.	Rosaceae	Dicot	Herb	Perennial	Naturalised	Europe	Unintentional	12	II
<i>Gnaphalium spicatum</i> Lamn.	Asteraceae	Dicot	Herb	Biennial	Casual	Europe	Unintentional	17	II
<i>Hesperis matronalis</i> L.	Brassicaceae	Dicot	Herb	Biennial	Casual	Europe	Fodder	14	II
<i>Hyoscyamus niger</i> L.	Solanaceae	Dicot	Herb	Biennial	Naturalised	Europe	Unintentional	11	II
<i>Iberis amara</i> L.	Brassicaceae	Dicot	Herb	Annual	Cs	Europe	Ornamental	32	III
<i>Impatiens glandulifera</i> Royle	Bulsimaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	36	III
<i>Lactuca dissecta</i> D. Don	Asteraceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	16	II
<i>Lactuca sativa</i> L.	Asteraceae	Dicot	Herb	Perennial	Invasive	South America	Unintentional	34	III
<i>Lepidium virginicum</i> L.	Brassicaceae	Dicot	Herb	Annual	Casual	Europe	Fodder	56	II
<i>Lithospermum arvense</i> L.	Boraginaceae	Dicot	Herb	Annual	Invasive	Europe	Fodder	57	II
<i>Lotus corniculatus</i> L.	Leguminaceae	Dicot	Herb	Perennial	Naturalised	Africa	Unintentional	12	II
<i>Lychnis coronaria</i> Desr.	Caprifoliaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	18	II
<i>Lythrum hyssopifolia</i> L.	Lythraceae	Dicot	Herb	Annual	Casual	Africa	Unintentional	41	II

							al		
<i>Malcolmia africana</i> R. Br.	Brassicaceae	Dicot	Herb	Annual	Naturalised	Africa	Unintentional	17	II
<i>Marrubium vulgare</i> L.	Lamiaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	15	II
<i>Medicago lupulina</i> L.	Leguminaceae	Dicot	Herb	Perennial	Naturalised	Europe	Fodder	45	IVA
<i>Medicago polymorpha</i> L.	Leguminaceae	Dicot	Herb	Annual	Naturalised	Europe	Fodder	51	V
<i>Medicago sativa</i> L.	Leguminaceae	Dicot	Herb	Biennial	Naturalised	Europe	Fodder	54	V
<i>Mentha longifolia</i> L.	Lamiaceae	Dicot	Herb	Perennial	Naturalised	North America	Fodder	43	IV
<i>Myosotis micrantha</i> auct. non Pall. ex Lehm.	Boraginaceae	Dicot	Herb	Annual	Naturalised	North America	Unintentional	16	II
<i>Narcissus tazetta</i> L.	Amaryllidaceae	Dicot	Herb	Annual	Invasive	Europe	Ornamental	16	II
<i>Oenothera rosea</i> Ait	Onagraceae	Dicot	Herb	Annual	Invasive	South America	Unintentional	14	II
<i>Onopordum acanthium</i> L.	Asteraceae	Dicot	Herb	Perennial	Casual	Europe	Unintentional	13	II
<i>Oxalis corniculata</i> L	Oxaladaceae	Dicot	Herb	Perennial	Naturalised	Europe	fodder	11	II
<i>Papaver dubium</i> L.	Papaveraceae	Dicot	Herb	Annual	Casual	South America	seed infestation	11	II
<i>Papaver hybridum</i> L.	Papaveraceae	Dicot	Herb	Annual	Naturalised	Europe	Unintentional	15	II

							al		
<i>Parthenium hysterophorus</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	North America	Unintentional	21	III
<i>Persicariaorientalis</i> L.	Polygonaceae	Dicot	Herb	Annual	Invasive	South America	Unintentional	32	III
<i>Petunia hybrida</i> Vilm	Solanaceae	Dicot	Herb	Biennial	Invasive	North America	Unintentional	12	II
<i>Pisum sativum</i> L.	Leguminaceae	Dicot	Herb	Annual	Cultivated	Europe	Unintentional	19	II
<i>Plantanus occidentalis</i> L	Plantanaceae	Dicot	Herb	Perennial	Ornamental	North America	Ornamental	17	II
<i>Polygonum abbreviatum</i> Kom.	Polygonaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	10	II
<i>Polygonum aviculare</i> L.	Polygonaceae	Dicot	Herb	Annual	Naturalised	Europe	Unintentional	13	III
<i>Polygonum minus</i> Huds.	Polygonaceae	Dicot	Herb	Annual	Naturalised	Europe	Unintentional	37	III
<i>Polygonum orientale</i> L.	Polygonaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	21	III
<i>Portulaca oleracea</i> L	Portulacaceae	Dicot	Herb	Annual	Invasive	North America	Unintentional	11	II
<i>Potentilla reptans</i> L.	Rosaceae	Dicot	Herb	Perennial	Naturalised	South America	Unintentional	13	II

<i>Ranunculus abortivus</i> L.	Ranunculaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	12	II
<i>Ranunculus laetus</i> Wall.	Ranunculaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	13	II
<i>Ranunculus muricatus</i> L.	Ranunculaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	16	II
<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	13	II
<i>Robinia pseudacacia</i> L.	Leguminaceae	Dicot	Herb	Perennial	Invasive	Europe	Plantation	18	II
<i>Rubus vestitus</i> Weihe	Rosaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	34	III
<i>Rumex dentatus</i> L.	Polygonaceae	Dicot	Herb	Perennial	Naturalised	Europe	Unintentional	30	III
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Dicot	Herb	Perennial	Naturalised	North America	Unintentional	32	III
<i>Rumex palustris</i> Smith	Polygonaceae	Dicot	Herb	Perennial	Naturalised	Europe	Unintentional	32	III
<i>Sagina saginoides</i> Karst.	Caryophyllaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	12	II
<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	Dicot	Herb	Perennial	Invasive	North America	Unintentional	55	IVB
<i>Scandix pecten-veneris</i> L.	Apiaceae	Dicot	Herb	Annual	Naturalised	North America	Unintentional	17	II

<i>Siegesbeckiaorientalis</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	Africa	Unintentional	10	II
<i>Sisymbriumloeselii</i> L.	Brassicaceae	Dicot	Herb	Biennial	Invasive	North America	Unintentional	64	V
<i>Solanum nigrum</i> L.	Solanaceae	Dicot	Herb	Annual	Naturalised	North America	Unintentional	19	II
<i>Sonchus arvensis</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	Europe	Unintentional	11	II
<i>Sonchus oleraceus</i> L.	Asteraceae	Dicot	Herb	Annual	Invasive	North America	Unintentional	13	II
<i>Stellaria media</i> Cyr	Caryophyllaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	18	III
<i>Tagetes erecta</i> L.	Asteraceae	Dicot	Herb	Annual	Naturalised	North America	Ornamental	13	II
<i>Tagetes minuta</i> L.	Asteraceae	Dicot	Herb	Perennial	Cs	North America	Ornamental	16	II
<i>Taraxacum officinale</i> (L.) Weber ex F.H.Wigg.	Asteraceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	25	III
<i>Torilisjaponicam</i> DC	Apiaceae	Dicot	Herb	Perennial	Naturalised	South Africa	Unintentional	17	II
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Dicot	Herb	Annual	Naturalised	Africa	Fodder	16	II
<i>Trifolium pratense</i> L.	Leguminaceae	Dicot	Herb	Perennial	Naturalised	Europe	Fodder	26	III

<i>Trifolium repens L.</i>	Leguminaceae	Dicot	Herb	Perennial	Naturalised	Europe	Fodder	33	III
<i>Urtica dioica L.</i>	Urticaceae	Dicot	Herb	Perennial	Invasive	Europe	Unintentional	64	V
<i>Verbascum thapsusL.</i>	Scrophulariaceae	Dicot	Herb	Perennial	Casual	Europe	Unintentional	33	III
<i>Veronica beccabunga L.</i>	Scrophulariaceae	Dicot	Herb	Perennial	Naturalised	Africa	Unintentional	13	II
<i>Veronica persicaPoir.</i>	Scrophulariaceae	Dicot	Herb	Perennial	Invasive	Africa	Unintentional	11	II
<i>Viola tricolor L.</i>	Vitaceae	Dicot	Herb	Annual	Casual	Europe	Unintentional	25	III
<i>Xanthium spinosum L.</i>	Asteraceae	Dicot	Herb	Annual	Invasive	South America	Unintentional	14	II
<i>Xanthium strumariumL.</i>	Asteraceae	Dicot	Herb	Annual	Invasive	Africa	Unintentional	19	II
<i>Zinia elegans Jacq</i>	Asteraceae	Dicot	Herb	Annual	Invasive	South America	Unintentional	43	IVA
<i>Agrostis stolonifera L</i>	Poaceae	Monocot	Herb	Perennial	Invasive	North America	Fodder	19	II
<i>Agrostis tenuis Sibth.</i>	Poaceae	Monocot	Herb	Perennial	Naturalised	North America	Unintentional	18	II
<i>Alisma lanceolatumWith</i>	Alismataceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	10	II

<i>Alopecurus aequalis</i> Sobol.	Poaceae	Monocot	Herb	Biennial	Naturalised	Europe	Unintentional	13	II
<i>Arthraxonprionodes</i> Dandy.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	13	II
<i>Bothriochloaischaemum</i> Ke ng	Poaceae	Monocot	Herb	Perennial	Invasive	Africa	Unintentional	11	II
<i>Bromus inermis</i> Leyss.	Poaceae	Monocot	Herb	Perennial	Invasive	Europe	Fodder	27	III
<i>Bromus japonicus</i> Thunb.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	26	III
<i>Bupleurum abchasicum</i> Manden.	Apiaceae	Monocot	Herb	Annual	Invasive	North America	Unintentional	13	II
<i>Cyperus difformis</i> L.	Cyperaceae	Monocot	Herb	Perennial	Invasive	South America	Unintentional	15	II
<i>Cyperus rotundus</i> L	Cyperaceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	23	III
<i>Cyperus sanguinolentus</i> L.	Cyperaceae	Monocot	Herb	Perennial	Casual	Europe	Unintentional	16	II
<i>Dactylis glomerata</i> L.	Poaceae	Monocot	Herb	Perennial	Invasive	Europe	Fodder	12	II
<i>Digitariaciliaris</i> L	Poaceae	Monocot	Herb	Annual	Invasive	North America	Unintentional	15	II
<i>Eleocharis acicularis</i> L.	Cyperaceae	Monocot	Herb	Perennial	Casual	Europe	Unintentional	17	II

		ot					al		
<i>Elymus dahuricus</i> Turcz. ex Griseb.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	15	II
<i>Eragrostis poaeoides</i> P. Beauv.	Poaceae	Monocot	Herb	Annual	Naturalised	Europe	Unintentional	17	II
<i>Hordeum murinum</i> L.	Poaceae	Monocot	Herb	Annual	Naturalised	North America	Food	17	II
<i>Iris ensata</i> Thunb.	Iridaceae	Monocot	Herb	Perennial	Invasive	South America	Unintentional	38	III
<i>Iris germanica</i> L.	Iridaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	17	II
<i>Iris reticulata</i> M. Bieb.	Iridaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	19	II
<i>Lolium perenne</i> L.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	18	II
<i>Lolium temulentum</i> L.	Poaceae	Monocot	Herb	Annual	Invasive	Europe	Unintentional	16	II
<i>Phragmites australis</i> Trin.	Poaceae	Monocot	Herb	Perennial	Invasive	South America	Unintentional	61	V
<i>Poa annua</i> L.	Poaceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	11	II
<i>Poa angustata</i> R.Br.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	16	II

<i>Polygonum hydropiper</i> L	Poaceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	32	II
<i>Polypogon fugax</i> Ness ex Steud.	Poaceae	Monocot	Herb	Perennial	Naturalised	Europe	Unintentional	69.5	v
<i>Setariaviridis</i> P. Beauv.	Poaceae	Monocot	Herb	Annual	Invasive	Africa	Fodder	14	II
<i>Sorghum halepense</i> Pers.	Poaceae	Monocot	Herb	Perennial	Invasive	Europe	Fodder	17	II
<i>Trapa natans</i> L.	Typhaceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	27	III
<i>Typha angustifolia</i> L.	Typhaceae	Monocot	Herb	Perennial	Invasive	Europe	Unintentional	37	III
<i>Vulpamyuros</i> Gmel.	Poaceae	Monocot	Herb	Annual	Invasive	Europe	Unintentional	19	II
<i>Althaea rosea</i> Cav.	Malvaceae	Dicot	Shrub	Biennial	Casual	North America	Unintentional	17	II
<i>Crataegus songarica</i> K. Koch	Rosaceae	Dicot	Shrub	Perennial	Casual	South America	Unintentional	17	II
<i>Jasminum humile</i> L.	Oleaceae	Dicot	Shrub	Perennial	Naturalised	Europe	Ornamental	13	II
<i>Lantana camara</i> L.	Boraginaceae	Dicot	Shrub	Perennial	Invasive	South America	Ornamental	16	II
<i>Rosa brunonii</i> Lindl.	Rosaceae	Dicot	Shrub	Perennial	Naturalised	Europe	Unintentional	22	III

Table 20: Number of genera and species belonging to different families

Family	No. of Genra	No. of Species
Asteraceae	27	35
Poaceae	17	22
Brassicaceae	8	14
Leguminaceae	8	10
Polygonaceae	3	8
Amaranthaceae	5	7
Apiaceae	7	5
Rosaceae	7	7
Solanaceae	4	7
Lamiaceae	1	5
Boraginaceae	4	4
Caryophyllaceae	4	4
Cyperaceae	2	4
Iridaceae	1	4
Ranunculaceae	1	4
Chenopodiaceae	1	3
Euphorbiaceae	2	3
Papaveraceae	1	3
Scrophulariaceae	2	3
Caprifoliaceae	2	2
Rubiaceae	1	2
Typhaceae	1	2
Apocynaceae	1	1
Bulsiaceae	1	1
Cannabaceae	1	1
Juglandaceae	1	1
Lythraceae	1	1

Oxiladaceae	1	1
Plantanaceae	1	1
Portulacaceae	1	1
Primulaceae	1	1
Salicaceae	1	1
Urticaceae	1	1
Vitaceae	1	1
Zygophyllaceae	1	1
Malvaceae	1	1
Adoxaceae	1	1
Total	124	173

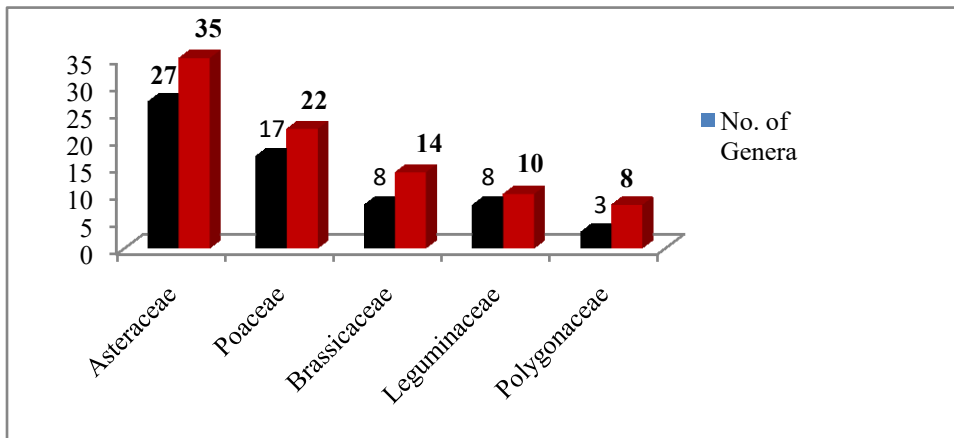


Fig. 33: Largest families contributing to alien flora of Kashmir

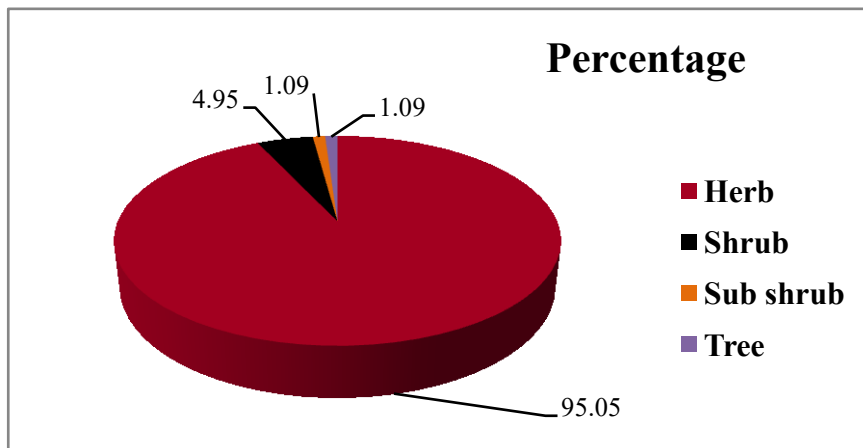


Fig.34: Percentage of various growth forms to alien flora of Kashmir

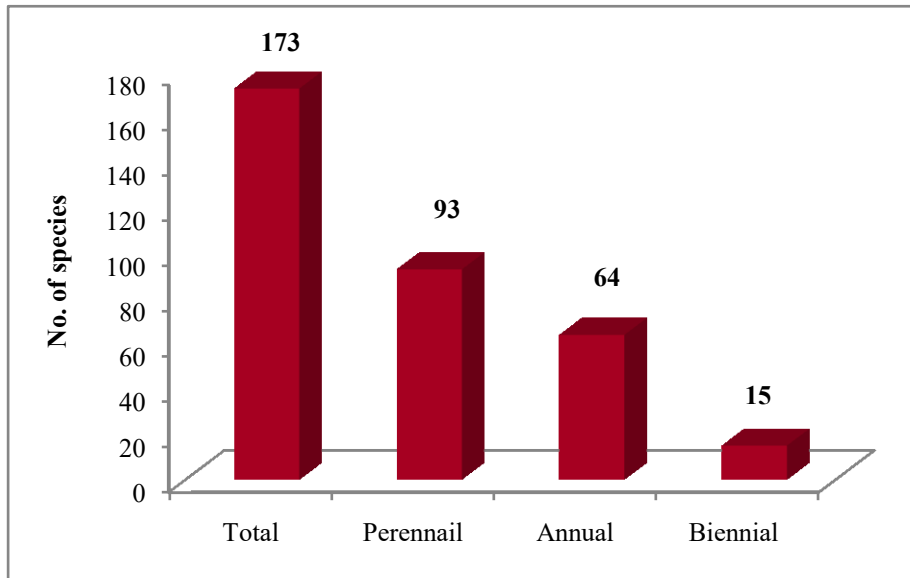


Fig.35: Number of plant species belonging to different Life span categories

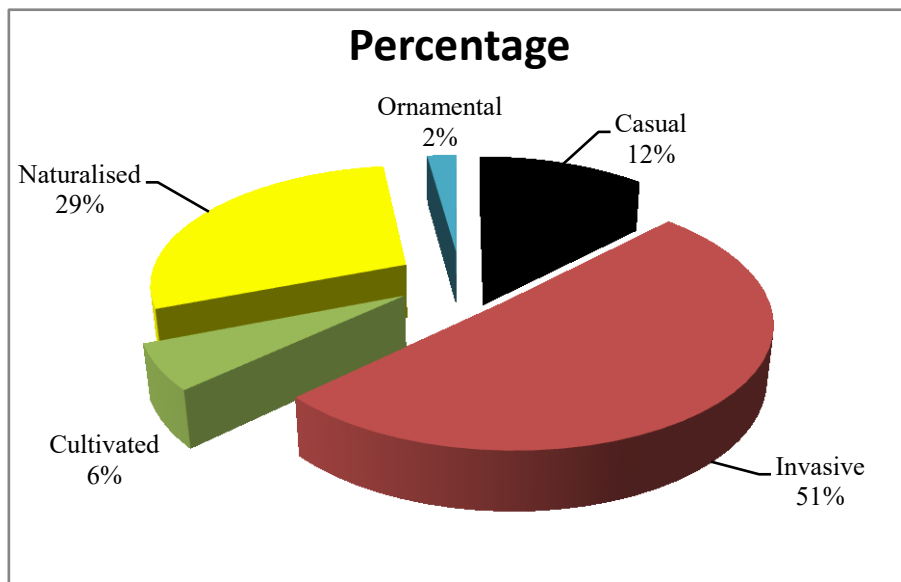


Fig. 36: Percentage of invasion status of alien flora of Kashmir

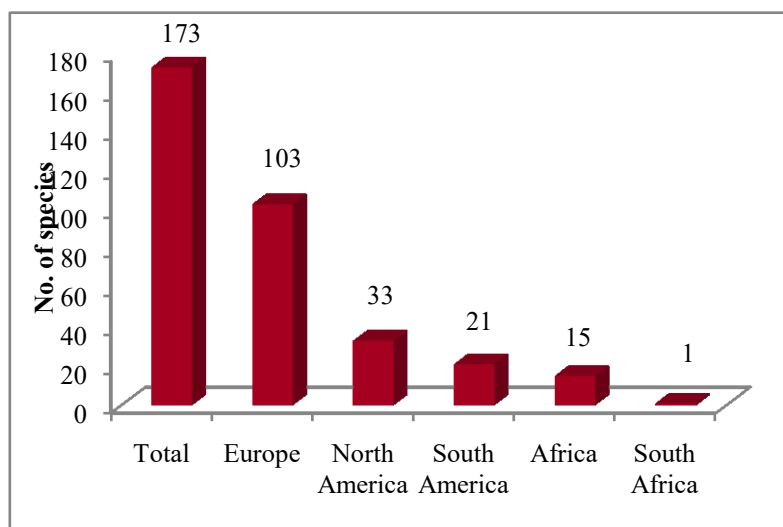


Fig.37: Contribution of various biogeographical regions to the alien flora of Kashmir

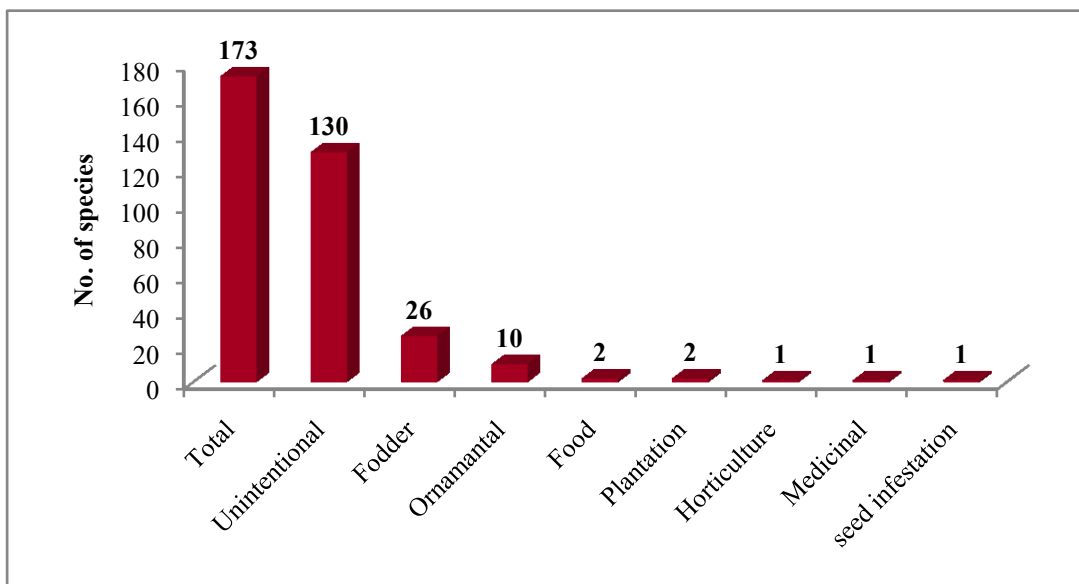


Fig. 38: Number of alien plant species and their purpose for introduction to Kashmir

Table 21: Top five invasive plant species of Kashmir

S. NO.	Species	Family	Frequency %	Density	Abundance
1.	<i>Sambucus wightiana</i> Wall. ex Wight & Arn.	Adoxaceae	74	77.25	2809.091
2.	<i>Anthemis cotula</i> L.	Asteraceae	84	91	3309.091
3.	<i>Centaurea iberica</i> Trevir. ex Spreng.	Asteraceae	63	66.7	2420
4.	<i>Conyza Canadensis</i> L.	Asteraceae	69	65.6	2490.909
5.	<i>Sisymbrium loeselii</i> L.	Brassicaceae	55	57.25	2081.818

(3) Invasion load in Jammu region of J&K

Out of 262 species recorded from Jammu region, 65 plant species are alien which belongs to 57 genera and 28 families (Table 23). Dicots were predominant with 57 species spread in 25 families. Monocots were represented by 10 species belonging to 6 genera and 3 Families (Table 24). The largest families were Asteraceae followed by Apocyanaceae (Fig 39). The study revealed that 50 species are herbs, 11 shrubs, 4 are trees. The percentage composition of these growth forms is given in Fig. 40.

Majority of the alien plant species are perennial (49 species) followed by annuals (16species).

Of the 262 plant species recorded 27 species are invasive and 235 are non-invasive. Among alien invasive, majority (18 species) are herbs and 9 species are shrubs.

Plant species recorded from Jammu region

Name of the species	Family	Plant group	Growth form	Life cycle	Habitat	Frequency%
<i>Gomphrena affinis</i> subsp. <i>pilbarensis</i> Kanis ex J. Palmer	Amaranthaceae	Dicot	Annual	Herb	Agricultural field	15
<i>Mallotus philippensis</i> (Lam.) Müll. Arg.	Euphorbiaceae	Dicot	Annual	Herb	Agricultural field	34.6
<i>Melilotus albus</i> Medik.	Fabaceae	Dicot	Annual	Herb	Agricultural field	30
<i>Salvia acuminata</i> Ruiz & Pav.	Lamiaceae	Dicot	Annual	Herb	Agricultural field	15
<i>Abutilon abutiloides</i> (Jacq.) Garcke ex Hochr.	Malvaceae	Dicot	Annual	Herb	Agricultural field	1.72
<i>Amaranthus viridis</i> L.	Amaranthaceae	Dicot	Perennial	Herb	Agricultural field	4.8
<i>Alstoniascholaris</i> (L.) R.Br.	Apocyanaceae	Dicot	Perennial	Herb	Agricultural field	2.16
<i>Senna tora</i> (L.) Roxb.	Fabaceae	Dicot	Perennial	Herb	Agricultural field	16
<i>Salvia absconditiflora</i> Greuter & Burdet	Lamiaceae	Dicot	Perennial	Herb	Agricultural field	14
<i>Argemone mexicana</i> L.	Papaveraceae.	Dicot	Perennial	Herb	Agricultural field	34
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Apocynaceae	Dicot	Annual	Herb	Aquatic	21
<i>Scirpus articulatus</i> L.	Cyperaceae	Monocot	Annual	Herb	Aquatic	13
<i>Pergulariadaemia</i> (Forssk.) Chiov.	Apocynaceae	Dicot	Perennial	Shrub	Aquatic	23
<i>Calotropis procera</i> (Willd.) R.Br.	Apocynaceae.	Dicot	Perennial	Herb	Aquatic	43
<i>Papaver dubium</i> L.	Papaveraceae.	Dicot	Perennial	Herb	Aquatic	23
<i>Fumaria indica</i> (Hauskn.) Pugsley	Paperveraceae	Dicot	Perennial	Herb	Aquatic	19
<i>Cymbopogon pospischilii</i> (K. Schum.) C.E. Hubb.	Poaceae	Monocot	Perennial	Herb	Aquatic	21
<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Dicot	Perennial	Tree	Distrubed land	30
<i>Boerhavia acutifolia</i> (Choisy) J.W. Moore	Nyctaginaceae	Dicot	Perennial	Shrub	Distrubed land	12
<i>Poa annua</i> L.	Poaceae	Monocot	Perennial	Herb	Distrubed land	45

Anagallis arvensis L.	Primulaceae	Dicot	Annual	Herb	Grasslands	23
<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	Dicot	Perennial	Herb	Grasslands	32.7
<i>Ageratum houstonianum</i> Mill.	Asteraceae	Dicot	Perennial	Herb	Grasslands	1.86
<i>Scirpus subterminalis</i> Torr.	Cyperaceae	Monocot	Perennial	Herb	Grasslands	21
<i>Opuntia stricta</i> (Haw.) Haw. var. <i>stricta</i>	Cactaceae	Dicot	Annual	Herb	Ponds	21
<i>Cannabis sativa</i> L.	Cannabaceae	Dicot	Perennial	Herb	Ponds	43
<i>Cyperus niveus</i> Retz.	Cyperaceae	Monocot	Perennial	Herb	Ponds	15
<i>Malvastrum coromandelium</i> (L.) Garcke	Malvaceae	Dicot	Perennial	Shrub	Riparian	15
<i>Oxalis corniculata</i> L.	Oxalidaceae	Dicot	Perennial	Shrub	Riparian	32.9
<i>Papaver hybridum</i> L.	Papaveraceae	Dicot	Perennial	Shrub	Riparian	21
<i>Randia spinosa</i> (Thunb.) Poir.	Rubiaceae	Dicot	Perennial	Herb	Riparian	23
<i>Scirpus acutus</i> Muhl. ex Bigelow	Cyperaceae	Monocot	Annual	Herb	Roadside	17
<i>Tridax procumbens</i> (L.) L.	Asteraceae	Dicot	Perennial	Herb	Roadside	21
<i>Xanthium strumarium</i> Linn.	Asteraceae	Dicot	Perennial	Herb	Roadside	28
<i>Conyza canadensis</i> (L.) Cronq	Asteraceae	Dicot	Perennial	Herb	Roadside	36
<i>Kigelia africana</i> (Lam.) Benth.	Bignoniaceae	Dicot	Perennial	Herb	Roadside	16
<i>Commelina africana</i> L.	Commelinaceae	Dicot	Perennial	Herb	Roadside	19
<i>Convolvulus arvensis</i>	Convolvaceae	Dicot	Perennial	Herb	Roadside	32
<i>Prosopis juliflora</i> (Sw.) DC.	Fabaceae	Dicot	Perennial	Herb	Roadside	18.99
<i>Malva parviflora</i> L.	Malvaceae	Dicot	Perennial	Herb	Roadside	31
<i>Borreria affinis</i> DC.	Rubiaceae	Dicot	Perennial	Herb	Roadside	23

<i>Lantana camara</i> L.	Verbenaceae	Dicot	Perennial	Herb	Roadside	48
<i>Hyptissuaveolens</i> (L.) Poit.	Lamiaceae	Dicot	Annual	Herb	Scrub forest	18
<i>Cyperus niveus</i> Retz.	Cyperaceae	Monocot	Perennial	Herb	Scrub forest	18
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dicot	Perennial	Tree	Scrub forest	43
<i>Ricinus communis</i> Linn.	Euphorbiaceae	Dicot	Perennial	Tree	Scrub forest	12
<i>Senna occidentalis</i> (L.) Link	Fabaceae	Dicot	Perennial	Herb	Scrub forest	23
<i>Sida spinosa</i> L.	Malvaceae	Dicot	Perennial	Shrub	Scrub forest	18
<i>Lysimachia arvensis</i> (L.) U.Manns&Anderb.	Primulaceae	Dicot	Annual	Herb	Scub forest	15
<i>Rubus ellipticus</i> Sm.	Rosaceae	Dicot	Annual	Herb	Scub forest	17
<i>Gomphrena celosiodes</i> Mart.	Amaranthaceae	Dicot	Perennial	Shrub	Scub forest	17
<i>Lepidium sativum</i> L.	Brassicaceae	Dicot	Perennial	Herb	Scub forest	32
<i>Pergularia extensa</i> (Jacq.) N.E. Br.	Apocynaceae	Dicot	Annual	Herb	Wasteland	12
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Dicot	Annual	Herb	Wasteland	18
<i>Eichhornia crassipes</i> (Mart.) Solms.	Pontederiaceae	Monocot	Annual	Herb	Wasteland	35
<i>Barleria cristata</i> L.	Acanthaceae	Dicot	Perennial	Shrub	Wasteland	23
<i>Heracleum lanatum</i> Michx.	Apiaceae	Dicot	Perennial	Tree	Wasteland	14
<i>Parthenium hysterophorus</i> L.	Asteraceae	Dicot	Perennial	Shrub	Wasteland	58.7
<i>Albizzia berteriana</i> (DC.) M.Gomez	Caesalpinaceae	Dicot	Perennial	Herb	Wasteland	4.05
<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Dicot	Perennial	Herb	Wasteland	23
<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Dicot	Perennial	Herb	Wasteland	32
<i>Ipomoea carnea</i> (Mart. Ex Choisy) Austin.	Convolvulaceae.	Dicot	Perennial	Herb	Wasteland	29

<i>Euphorbia prostrata</i> Aiton	Euphorbiaceae	Dicot	Perennial	Shrub	Wasteland	35
<i>Vitis negundo</i> L.	Lamiaceae	Dicot	Perennial	Shrub	Wasteland	12
<i>Datura innoxia</i> Mill.	Solanaceae	Dicot	Perennial	Shrub	Wasteland	39

Table 23: Number of genera and species belonging to different families

Family	No. Of Genera	No. of Species
Asteraceae	6	7
Apocyanaceae	5	5
Cyperaceae	3	5
Convolvaceae	2	4
Euphorbiaceae	3	3
Fabaceae	3	4
Lamiaceae	3	4
Malvaceae	4	4
Papaveraceae	3	4
Amaranthaceae	3	3
Poaceae	2	2
Primulaceae	2	2
Rubiaceae	2	2
Solanaceae	2	2
Acanthaceae	1	1
Apiaceae	1	1
Bignoniaceae	1	1
Brassicaceae	1	1
Cactaceae	1	1
Caesalpinaceae	1	1
Cannabaceae	1	1
Commelinaceae	1	1
Mimosaceae	1	1
Nyctaginaceae	1	1

Oxalidaceae	1	1
Pontederiaceae	1	1
Rosaceae	1	1
Verbenaceae	1	1
Total	57	65

Table 24: Conspectus of Alien plant recorded

.NO.	Groups	Families	Number of Genera	Number of Species
1	Dicotyledons	25	51	55
2	Monocotyledons	3	6	10
Total		28	57	65

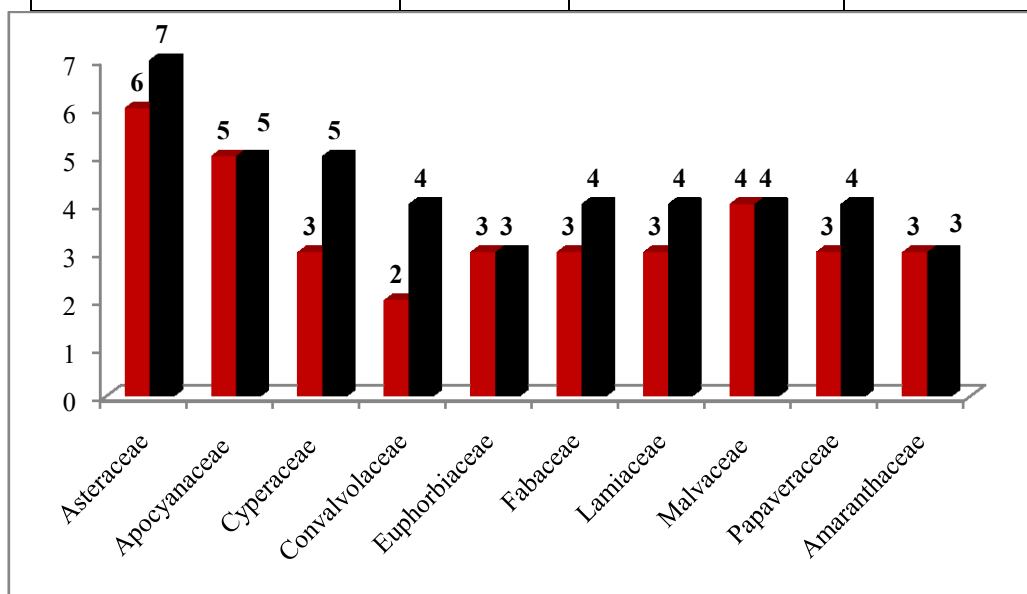


Fig.39: Top ten families with larger number of species

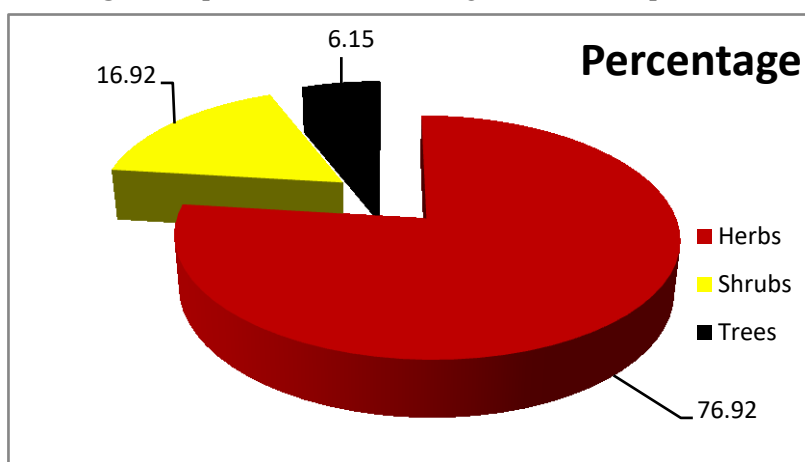


Fig.40: Percentage of different growth forms

LIST OF PLANTS & DATA ANALYSIS
(Himachal Pradesh)

List of Alien species:

S.No.	Name	Family	Nativity	Taxonomic Group	Taxonomic Sub-Group	Life Form	Habit	Habitat	Mode Of Intro
1	<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	Trop. America	AN	D	H	A	W	O
2	<i>Anagallis arvensis</i> L.	Primulaceae	Europe	AN	D	H	A	CF	Ui
3	<i>Argemone mexicana</i> L.	Papaveraceae	S. America	AN	D	H	A	W	Ui

4	<i>Bidens pilosa</i> L.	Asteraceae	Trop. America	AN	D	H	A	CF	Ui
5	<i>Calyptocarpus vialis</i> Less.	Asteraceae	Mexico	AN	D	H	A	W,AR	Ui
6	<i>Calotropis procera</i> (Ait.) R. Br.	Asclepiadaceae	Trop. Africa	AN	D	S	P	W	Ui
7	<i>Cannabis sativa</i> L.	Cannabaceae	Central Asia	AN	D	H	P	AR, W	Ui
8	<i>Cassia tora</i> L.	Caesalpiaceae	S. America	AN	D	H	A	W	Ui
9	<i>Coronopus didymus</i> (L.) Sm.	Brassicaceae	S. America	AN	D	H	A	W,OP	Ui
10	<i>Cyperus difformis</i> L.	Cyperaceae	Trop. America	AN	M	H	A	CF	Ui
11	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Trop. America	AN	D	H	A	CF	Ui
12	<i>Gnaphalium polycaulon</i> Pers.	Asteraceae	Trop. America	AN	D	H	A	W	Ui

13	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Trop. America	AN	D	H	A	AR	Ui
14	<i>Impatiens balsamina</i> L.	Balsaminaceae	Trop. America	AN	D	H	A	RB	O
15	<i>Lantana camara</i> L.	Verbenaceae	Trop. America	AN	D	H	P	F	O
16	<i>Martynia annua</i> L.	Pedaliaceae	Trop. America	AN	D	H	P	W	Ui
17	<i>Oxalis corniculata</i> L.	Oxalidaceae	Europe	AN	D	H	P	CF	Ui
18	<i>Parthenium hysterophorus</i> L.	Asteraceae	N. America	AN	D	H	A	W	Ui
19	<i>Rubus ellipticus</i> Smith	Rosaceae	Trop. America	AN	D	S	P	W	Ui
20	<i>Sida acuta</i> Burm.f.	Malvaceae	Trop. America	AN	D	H	A	W	Ui
21	<i>Solanum nigrum</i> L.	Solanaceae	Trop. America	AN	D	H	A	CF	Ui

22	<i>Sonchus asper</i> (L.) Hill	Asteraceae	Mediterranean	AN	D	H	A	AR	Ui
23	<i>Xanthium strumarium</i> L.	Asteraceae	Trop. America	AN	D	H	A	AR, WP	Ui

Life form: H—Herb; S—Shrub ; Habit: A—Annual; P—Perennial ;Habitat: W— Wastelands; CF—Cultivated fields; F—Forests; AR—Along roadside; CF—Crop fields; RB—River beds, OP—Openfield ; Mode of introduction: O—Ornamental; Ui—Unintentional

Data analysis:

Chamba:

Name	Density	Frequency (%)	Abundance	IVI
<i>Lantana camara</i>	1.09	37.50	2.9	15.29

Una:

Name	Density	Frequency (%)	Abundance	IVI
<i>Ageratum conyzoides</i>	1.4	4.81	30	15.11
<i>Bidens pilosa</i>	0.71	2.08	34.29	11.86
<i>Hyptis suaveolens</i>	21.74	38.05	57.14	101.35

<i>Lantana camara</i>	1.09	37.50	2.9	15.29
<i>Parthenium hysterophorus</i>	5.11	10.23	50	33.78

Sirmaur:

Name	Relative Density	Relative Frequency	Relative Abundance	IVI
<i>Ageratum conyzoides</i>	19.712	10.48	2.71	32.90
<i>Oxalis corniculata</i>	18.89	7.26	3.75	29.9
<i>Lantana camara</i>	2.22	8.06	0.39	10.67
<i>Parthenium hysterophorus</i>	5.80	4.84	1.73	12.37
Unidentified grass	7.16	3.23	3.19	13.58

**LIST OF PLANTS & DATA ANALYSIS
(Uttarakhand)**

Alien Plant Species of Uttarakhand Himalaya:

S.No.	Species	Family	Taxonomic group	Taxonomic subgroup	Life form	Nativity	Mode of introduction	Habit	Habitat
1	<i>Coronopus didymus</i>	Brassicaceae	Angiosperm	Dicot	H	S. America	Ui	Annual / biennial	W
2	<i>Taxicum officinale</i>	Asteraceae	Angiosperm	Dicot	H	Europe	Ui	Annual	W
3	<i>Arabidopsis thaliana</i>	Brassicaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	F/W
4	<i>Cassia occidentalis</i> L.	Fabaceae	Angiosperm	Dicot	S	Trop. America	Ui	Perennial	W
5	<i>Hyptis suaveolens</i>	Lamiaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
6	<i>Acacia farnesiana</i> (L.) Willd.	Mimosaceae	Angiosperm	Dicot	T	Australia	Ui	Perennial	F
7	<i>Ageratum conyzoides</i> L.	Asteraceae	Angiosperm	Dicot	H	Trop. America	O	Annual	W
8	<i>Ageratum houstonianum</i> Mill.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
9	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	CF

10	<i>Anagallis arvensis</i> L.	Primulaceae	Angiosperm	Dicot	H	Europe	Ui	Annual	CF
11	<i>Bidens pilosa</i> L.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	CF
12	<i>Blainvillea mella</i> (L.) Philipson	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
13	<i>Cannabis sativa</i> L.	Cannabinaceae	Angiosperm	Dicot	H	Central Asia	Ui	Perennial	W, AR
14	<i>Chenopodium album</i> L.	Chenopodiaceae	Angiosperm	Dicot	H	Europe	Fd	Annual	CF
15	<i>Commelina benghalensis</i> L.	Commelinaceae	Angiosperm	Dicot	H	Trop. Asia and Africa	Ui	Perennial	W
16	<i>Cuscuta reflexa</i> Roxb	Cuscutaceae	Angiosperm	Dicot	H	Mediterranean	Ui	Annual	P
17	<i>Cyperus rotundus</i>	Cyperaceae	Angiosperm	Dicot	H		Ui	Perennial	W, CF
18	<i>Datura metel</i> L	Solanaceae	Angiosperm	Dicot	S	Trop. America	Ui	Perennial	AR,W
19	<i>Echinochloa colona</i> (L.) Link	Poaceae	Angiosperm	Monocot	G	S. America	Ui	Annual	RB
20	<i>Eupatorium glandulosum</i> H.B.K.	Asteraceae	Angiosperm	Dicot	H	Europe	Ui	Perennial	W
21	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	CF
22	<i>Gnaphalium coarctatum</i> Willd.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
23	<i>Gnaphalium pensylvanicum</i> Willd.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	RB

24	<i>Gnaphalium polycaulon</i> Pers.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
25	<i>Indigo feraastragalina</i> DC.	Fabaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	F
26	<i>Indigo feralinifolia</i> (L.f.) Retz.	Fabaceae	Angiosperm	Dicot	H	S. America	Ui	Annual	AR
27	<i>Lantana camara</i> L.	Verbenaceae	Angiosperm	Dicot	S	Trop. America	O	Perennial	F
28	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Angiosperm	Dicot	S	Trop. America	Af	Perennial	F
29	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Angiosperm	Dicot	H	Peru	O	Annual	W
30	<i>Nicotiana plumbaginifolia</i> Viviani	Solanaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
31	<i>Oxalis corniculata</i> L.	Oxalidaceae	Angiosperm	Dicot	H	Europe	Ui	Perennial	CF
32	<i>Oxalis latifolia</i>	Oxalidaceae	Angiosperm	Dicot	H	America	Ui	Perennial	CF
33	<i>Parthenium hysterophorus</i> L.	Asteraceae	Angiosperm	Dicot	H	N. America	Ui	Annual	W
34	<i>Pennisetum purpureum</i> Schum.	Poaceae	Angiosperm	Monocot	G	Trop. America	Fo	Annual	F
35	<i>Physalis angulata</i> L.	Solanaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	W
36	<i>Physalis peruviana</i> L.	Solanaceae	Angiosperm	Dicot	H	Peru	Ui	Annual	CF, W
37	<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae	Angiosperm	Dicot	S	Mexico	Af	Perennial	W

38	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Angiosperm	Dicot	H	Asia	Ui	Annual	W
39	<i>Ricinus communis</i> L.	Euphorbiaceae	Angiosperm	Dicot	S	Central Asia	Ui	Perennial	W
40	<i>Rubus ellipticus</i> Smith.	Rosaceae	Angiosperm	Dicot	S	Trop. America	Ui	Perennial	W
41	<i>Rubus niveus</i> Thunb.	Rosaceae	Angiosperm	Dicot	S	Asia	Ui	Perennial	F
42	<i>Rumex hastatus</i> D.Don	Polygonaceae	Angiosperm	Dicot	H	Asia	Ui	Perennial	W
43	<i>Saccharum spontaneum</i> L.	Poaceae	Angiosperm	Monocot	G	Trop. West Asia	Ui	Perennial	RB
44	<i>Sennaalata</i> (L.) Roxb	Fabaceae	Angiosperm	Dicot	S	Trop. America	O	Annual	W
45	<i>Sidaacuta</i> Burm. f	Malvaceae	Angiosperm	Dicot	H	Trop. America	Ui	Perennial	W
46	<i>Solanum mauritianum</i>	Solanaceae	Angiosperm	Dicot	S	S. America	O	Perennial	W
47	<i>Solanum nigrum</i> L.	Solanaceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	CF
48	<i>Solanum torvum</i> Sw.	Solanaceae	Angiosperm	Dicot	S	West Indies	Ui	Perennial	F
49	<i>Solanum viarum</i> Dunal	Solanaceae	Angiosperm	Dicot	H	Trop. America	Ui	Perennial	F

50	<i>Sonchu solearecus</i> L.	Asteraceae	Angiosperm	Dicot	H	Mediterranean	Ui	Annual	RB
51	<i>Stellaria media</i> (L.) Villars	Caryophyllaceae	Angiosperm	Dicot	H	Europe	Ui	Annual	W
52	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Angiosperm	Dicot	H	West Indies	Ui	Annual	W,AR
53	<i>Tridax procumbens</i> L.	Asteraceae	Angiosperm	Dicot	H	C. America	Ui	Perennial	W
54	<i>Trifolium repens</i> L.	Fabaceae	Angiosperm	Dicot	H	Europe	Ui	Perennial	W
55	<i>Xanthium strumarium</i> L.	Asteraceae	Angiosperm	Dicot	H	Trop. America	Ui	Annual	AR, W

Abbreviations: H= Herb; S=Shrub; Ui= Unintentional; W= Wasteland; F=Forest; AR= Along roadside; CF= Cultivated fields; RB= River beds; O= Ornamental; P= Parasite; Af= Agroforestry; Fo= Fodder

LIST OF PLANTS & DATA ANALYSIS
(Sikkim & Darjeeling)

List of IAPS found in Sikkim Sikkim Himalaya.

Accepted names	Families	Taxonomic group	Life form	Habit	Habitats	Phenology	Country of Origin	Mode of introduction
<i>Acacia mearnsii</i> De Wild.	Fabaceae	Dicot	Perennial	Tree	Roadsides	Aug.–Mar.	South east Australia	Ornamental
<i>Adenostemma lavenia</i> (L.) Kuntze	Asteraceae	Dicot	Annual	Herb	Under sal forest	Aug.– Oct.	S. America	Unintentional
<i>Aeschynomene americana</i> L.	Fabaceae	Dicot	Annual	Herb	Roadsides	Aug.–Jan.	Tropical & Subtropical America	Unintentional
<i>Ageratum conyzoides</i> L.	Asteraceae	Dicot	Annual	Herb	Wastelands	Jul. – Jan.	C. America	Ornamental
<i>Ageratum houstonianum</i> Mill.	Asteraceae	Dicot	Annual	Herb	Wastelands	Jul. –Feb.	C. America	Ornamental

<i>Ageratina adenophora</i> (Spreng.) R.M.King&H.Rob.	Asteraceae	Dicot	Perennial	Shrub	Open forest, Agricultural Lands	Aug.–Feb.	Mexico	Ornamental
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	Dicot	Perennial	Herb	River beds	Aug.–Nov.	South America	Unintentional
<i>Alternanthera pungens</i> Kunth	Amaranthaceae	Dicot	Annual	Herb	Wastelands	Aug.–Dec.	Trop. America	Unintentional
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Dicot	Annual	Herb	River beds	Jul.–Feb.	Trop. America	Unintentional
<i>Anaphalis contorta</i> (D.Don) Hook.f.	Asteraceae	Dicot	Perennial	Herb	Open pastures, roadsides	Jun.– Oct.	C. Asia	Unintentional
<i>Anaphalis margaritacea</i> (L.) Benth. &Hook.f.	Asteraceae	Dicot	Perennial	Herb	Roadsides	Aug.–Nov.	N. America	Unintentional
<i>Argemone mexicana</i> L.	Papaveraceae	Dicot	Annual	Herb	Wastelands	Dec.– Jun.	Trop. Central	Unintentional

							& South America	
<i>Asclepias curassavica</i> L.	Apocynaceae	Dicot	Perennial	Herb	Roadsides	Throughout the year	Mexico to Tropical America	Unintentional
<i>Bidens pilosa</i> L.(Figure 6D)	Asteraceae	Dicot	Annual	Herb	Roadsides	Jul.– Dec.	Tropical & Subtropical America	Unintentional
<i>Blainvillea acmella</i> (L.) Philipson	Asteraceae	Dicot	Annual	Herb	Wastelands	Aug.– Dec.	Trop. America	Unintentional
<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Dicot	Annual	Herb	Agricultural Lands	Aug. – Feb.	Europe	Unintentional
<i>Brugmansia suaveolens</i> (Humb. &Bonpl. ex Willd.) Sweet	Solanaceae	Dicot	Perennial	Shrub	Forest edges	May.–Nov.	SE Brazil	Unintentional
<i>Calceolaria tripartita</i> Ruiz &	Calceolariaceae	Dicot	Annual	Herb	Along the road side	Apr.–Dec.	C.America	Ornamental

Pav.(Figure 6E)								
<i>Calotropis gigantea</i> (L.) W.T.Aiton	Apocynaceae	Dicot	Perennial	Shrub	Wastelands	Throughout the year	Tropical Asia	Unintentional
<i>Calotropis procera</i> (Aiton) W.T.Aiton	Apocynaceae	Dicot	Perennial	Shrub	Agricultural Lands	Mar.–Dec.	Trop. Africa	Unintentional
<i>Cannabis sativa</i> L.	Cannabaceae	Dicot	Perennial	Herb	Irrigated lands	May.– Jul.	C. Asia	Narcotic
<i>Cardamine hirsuta</i> L.	Brassicaceae	Dicot	Perennial	Herb	River beds	Jul.–Feb.	Trop. America	Unintentional
<i>Celosia argentea</i> L.	Amaranthaceae	Dicot	Annual	Herb	Crop fields	Sept.–Dec.	Tropical Africa	Food grain
<i>Cenchrus purpureus</i> (Schumach.) Morrone	Poaceae	Monocot	Annual	Grass	Forests	Aug.–Jan.	Trop. America	Fodder
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.(Figure 6F)	Asteraceae	Dicot	Perennial	Herb	Roadsides	Dec.–May.	N. America	Ornamental
<i>Cissus discolor</i> Blume	Vitaceae	Dicot	Perennial	Climber	Under	Jun.–Nov.	Java	Unintentional

					Canopy			
<i>Cleome gynandra</i> L.	Cleomaceae	Dicot	Annual	Herb	Wastelands	Sept.–Dec.	Trop. America	Unintentional
<i>Cleome rutidosperma</i> DC.	Cleomaceae	Dicot	Annual	Herb	Roadsides	Aug.–Nov.	Trop. Africa	Unintentional
<i>Cleome viscosa</i> L.	Cleomaceae	Dicot	Annual	Herb	Roadsides	Aug.–Dec.	Trop. America	Unintentional
<i>Corchorus trilocularis</i> L.	Malvaceae	Dicot	Annual	Herb	Wastelands	Jun.–Dec.	Trop. Africa	Unintentional
<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	Asteraceae	Dicot	Annual	Herb	Forests	Jul.– Dec.	Trop. America	Unintentional
<i>Crotalaria linifolia</i> L.f.	Fabaceae	Dicot	Annual	Herb	Crop fields	Aug.–Mar.	Tropical & Subtropical Asia.	Unintentional
<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Dicot	Annual	Herb	Parasites	Sept.–Apr.	Mediterranean	Unintentional
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Monocot	Perennial	Grass	Agricultural Lands, Roadsides	Throughout the year	Africa	Unintentional

<i>Cyperus difformis</i> L.	Cyperaceae	Monocot	Annual	Sedges	Crop fields	Aug.–Dec.	Trop. America	Unintentional
<i>Cyperus iria</i> L.	Cyperaceae	Monocot	Annual	Sedges	Crop fields	Aug.–Jan.	Trop. America	Unintentional
<i>Cytisus scoparius</i> (L.) Link	Fabaceae	Dicot	Annual	Herb	Roadsides	Jul.–Feb.	Europe	Unintentional
<i>Datura metel</i> L.	Solanaceae	Dicot	Perennial	Shrub	Wastelands	Aug.–Feb.	Trop. America	Unintentional
<i>Datura stramonium</i> L.	Solanaceae	Dicot	Perennial	Shrub	Road side	Jun.–Nov.	Trop. America	Unintentional
<i>Echinochloa colonum</i> (L.) Link	Poaceae	Monocot	Annual	Grass	River beds	Aug.–Mar.	South America	Unintentional
<i>Echinochloa crus-galli</i> (L.) P.Beauv.	Poaceae	Monocot	Annual	Grass	River beds	Aug.–Mar.	South America	Unintentional
<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Dicot	Annual	Herb	Roadsides	Jun.–Mar.	Trop. America	Unintentional
<i>Elephantopus scaber</i> L.	Asteraceae	Dicot	Perennial	Herb	Road side	Throughout	C. Asia	Unintentional

						the year		
<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Dicot	Annual	Herb	River beds	Aug.–Mar.	Trop. America	Unintentional
<i>Erigeron karvinskianus</i> DC	Asteraceae	Dicot	Perennial	Herb	Agricultural lands	Jun.–Sept.	C. America	Weed
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dicot	Annual	Herb	Crop fields	Aug.– Dec.	Tropical & Subtropical America	Unintentional
<i>Fagopyrum cymosum</i> (Trevir.) Meisn.	Polygonaceae	Dicot	Annual	Herb	Wastelands	Jul.– Sept.	SW. China	Unintentional
<i>Fragaria nubicola</i> (Lindl.) ex Hook.f.) Lacaita(Figure 7H)	Rosaceae	Dicot	Perennial	Herb	Grass land	May.–Aug.	Temp. Europe	Unintentional
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Dicot	Annual	Herb	River beds	Aug.–Jan.	Trop. America	Unintentional
<i>Galinsoga quadriradiata</i> Ruiz & Pav.	Asteraceae	Dicot	Annual	Herb	Wastelands	Dec.–May.	Mexico	Unintentional

<i>Gnaphalium polycaulon</i> Pers.	Asteraceae	Dicot	Annual	Herb	Wastelands	Aug.–Dec.	Trop. America	Unintentional
<i>Impatiens balsamina</i> L.	Balsaminaceae	Dicot	Annual	Herb	River beds	Jul.–Jan.	Trop. America	Ornamental
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	Monocot	Perennial	Grass	Wastelands	Jul.– Dec.	Trop. America	Unintentional
<i>Indigofera astragalina</i> DC.	Fabaceae	Dicot	Annual	Herb	Forests	Aug.–Dec.	Trop. America	Unintentional
<i>Indigofera trita</i> L.f.	Fabaceae	Dicot	Perennial	Shrub	Forests	Aug.–Dec.	Trop. Africa	Unintentional
<i>Ipomoea carnea</i> subsp. <i>Fistulosa</i> (Mart. ex Choisy) D.F.Austin	Convolvulaceae	Dicot	Perennial	Shrub	Wastelands	Throughout the year	Mexico to S. Tropical America	Unintentional
<i>Ipomoea muricata</i> (L.) Jacq.	Convolvulaceae	Dicot	Annual	Herb	Roadsides	Aug.–Dec.	Trop. America	Unintentional
<i>Ipomoea purpurea</i> (L.) Roth	Convolvulaceae	Dicot	Annual	Herb	Wastelands	May.–Apr.	South America	Ornamental
<i>Lantana camara</i> L.	Verbenaceae	Dicot	Perennial	Shrub	Forests	Throughout	Trop.	Ornamental

(Figure 7I)						the year	America	
<i>Macropitilium atropurpureum</i> (DC.) Urb.	Fabaceae	Dicot	Perennial	Herb	Agricultural lands	Jun.–Feb.	Trop. America	Deliberately
<i>Martynia annua</i> L.	Martyniaceae	Dicot	Perennial	Herb	Roadsides	Aug.–Dec.	Trop. America	Ornamental
<i>Melochia corchorifolia</i> L.	Malvaceae	Dicot	Perennial	Herb	Forests	Sept.–Nov.	Trop. America	Unintentional
<i>Mesosphaerum suaveolens</i> (L.) Kuntze	Lamiaceae	Dicot	Annual	Herb	Roadsides	Aug.– Mar.	Trop. America	Unintentional
<i>Miconia crenata</i> (Vahl) Michelang.	Melastomataceae	Dicot	Annual	Herb	Roadsides	Jun.– Dec.	Trop. America	Unintentional
<i>Mikania micrantha</i> Kunth(Figure 7J)	Asteraceae	Dicot	Perennial	Climber	Open disturbed, Agricultural lands	Dec.–Apr.	South America	Deliberately
<i>Mimosa pudica</i> L.	Fabaceae	Dicot	Perennial	Herb	Forests	Jul.–Feb.	Brazil	Unintentional

<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Dicot	Annual	Herb	Wastelands	Aug.–Dec.	Mexico to Central America.	Ornamental
<i>Nicandra physalodes</i> (L.) Gaertn.	Solanaceae	Dicot	Annual	Herb	Waste areas, Roadsides	Oct.–Feb.	Peru	Ornamental
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	Dicot	Annual	Herb	Waste land	Apr.–Nov.	Trop. America	Unintentional
<i>Oxalis corniculata</i> L.	Oxalidaceae	Dicot	Perennial	Herb	Crop fields	Aug.–Dec.	Europe	Unintentional
<i>Oxalis debilis</i> Kunth	Oxalidaceae	Dicot	Perennial	Herb	Roadsides	Jan.–Apr.	S. America	Ornamental
<i>Oxalis latifolia</i> Kunth	Oxalidaceae	Dicot	Perennial	Herb	Roadsides	Feb.–Apr.	Trop. America	Ornamental
<i>Parthenium hysterophorus</i> L.	Asteraceae	Dicot	Annual	Herb	Roadsides	Jul.–Feb.	Tropical & Subtropical America	Food grain
<i>Passiflora foetida</i> L.	Passifloraceae	Diocot	Perennial	Herb	Wastelands	Jun.–Dec.	Tropical & Subtropical	Unintentional

							America.	
<i>Peperomia pellucida</i> (L.) Kunth	Piperaceae	Dicot	Annual	Herb	Roadsides	Jul.–Dec.	Trop. South America	Unintentional
<i>Physalis angulata</i> L.	Solanaceae	Dicot	Annual	Herb	Disturbed areas, Roadsides	Jul.–Dec.	Trop. America	Unintentional
<i>Plantagoasiatica</i> subsp. <i>erosa</i> (Wall.) Z.Yu Li	Plantaginaceae	Dicot	Annual	Herb	Meadows	Apr.–Jun.	Mediterranean	Unintentional
<i>Pontederia</i> <i>crassipes</i> Mart.	Pontederiaceae	Monocot	Perennial	Herb	Aquatic	Aug.–Dec.	Trop. America	Ornamental
<i>Portulaca oleracea</i> L.	Portulacaceae	Dicot	Annual	Herb	Roadsides	May.–Sept.	S. America	Fodder
<i>Rorippa dubia</i> (Pers.) H.Hara	Brassicaceae	Dicot	Annual	Herb	Crop fields	Aug.–Dec.	Trop. America	Unintentional
<i>Rubus</i> <i>ellipticus</i> Sm.(Figure 7K)	Rosaceae	Dicot	Perennial	Shrub	Cultivated land	Jul.– Dec.	Trop. America	Unintentional
<i>Saccharum spontaneum</i> L.	Poaceae	Monocot	Perennial	Grass	River beds	Aug.–Dec.	Trop. West Asia	Unintentional

<i>Senna occidentalis</i> (L.) Link	Fabaceae	Dicot	Perennial	Herb	Wastelands	Jul.–Dec.	Tropical & Subtropical America	Unintentional
<i>Senna tora</i> (L.) Roxb.	Fabaceae	Dicot	Annual	Herb	Wastelands	Aug.–Dec.	Central America	Unintentional
<i>Sida acuta</i> Burm.f.	Malvaceae	Dicot	Annual	Herb	Wastelands	Jul.–Dec.	Trop. America	Unintentional
<i>Solanum seafortianum</i> Andrews	Solanaceae	Dicot	Perennial	Climber	Wastelands	Aug.–Dec.	Brazil	Ornamental
<i>Solanum torvum</i> Sw.	Solanaceae	Dicot	Perennial	Shrub	Forests	Oct.– Mar.	West Indies	Unintentional
<i>Solanum viarum</i> Dunal	Solanaceae	Dicot	Annual	Herb	Forests	Aug.–Feb.	Trop. America	Unintentional
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Dicot	Annual	Herb	Roadsides	Aug.–Feb.	Mediterranean	Unintentional
<i>Sonchusoleraceus</i> (L.) L.	Asteraceae	Dicot	Annual	Herb	Roadsides	Aug.–Dec.	Mediterranean	Unintentional
<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	Diocot	Annual	Herb	Waste places	Jun.–Aug.	Mediterranean	Unintentional
<i>Stephania japonica</i>	Menispermaceae	Dicot	Perennial	Climber	Scattered	Jun.–Dec.	Japan	Unintentional

(Thunb.) Miers					on plains			
<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Diocot	Annual	Herb	Wastelands, Roadsides	Aug.–Jan.	Tropical & Subtropical America.	Unintentional
<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Asteraceae	Dicot	Perennial	Herb	Agricultural lands	Sept.–May.	Trop. America	Ornamental
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Dicot	Perennial	Herb	Wastelands	Throughout the year	Trop. America	Unintentional
<i>Tridax procumbens</i> L. (Figure 7L)	Asteraceae	Dicot	Perennial	Herb	Agricultural lands, roadsides	Throughout the year	C. America	Unintentional
<i>Trifolium repens</i> L.	Fabaceae	Dicot	Perennial	Herb	Roadsides, waste areas	Throughout the year	Europe	Fodder
<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	Dicot	Annual	Herb	Wastelands	Jun.– Dec.	Trop. America	Unintentional
<i>Urena lobata</i> L.	Malvaceae	Dicot	Perennial	Herb	Wastelands	Jul.–Dec.	Trop. America	Unintentional

<i>Vachellia farnesiana</i> (L.) Wight & Arn.	Fabaceae	Dicot	Perennial	Tree	Roadsides	Jan.–May.	Trop. South America	Unintentional
<i>Xanthium strumarium</i> L.	Asteraceae	Dicot	Annual	Herb	Roadsides	Aug.–Mar.	Trop. America	Unintentional
<i>Youngia japonica</i> (L.) DC.	Asteraceae	Dicot	Annual	Herb	Roadsides	Aug.–Dec.	Trop. South America	Unintentional

Diversity analysis

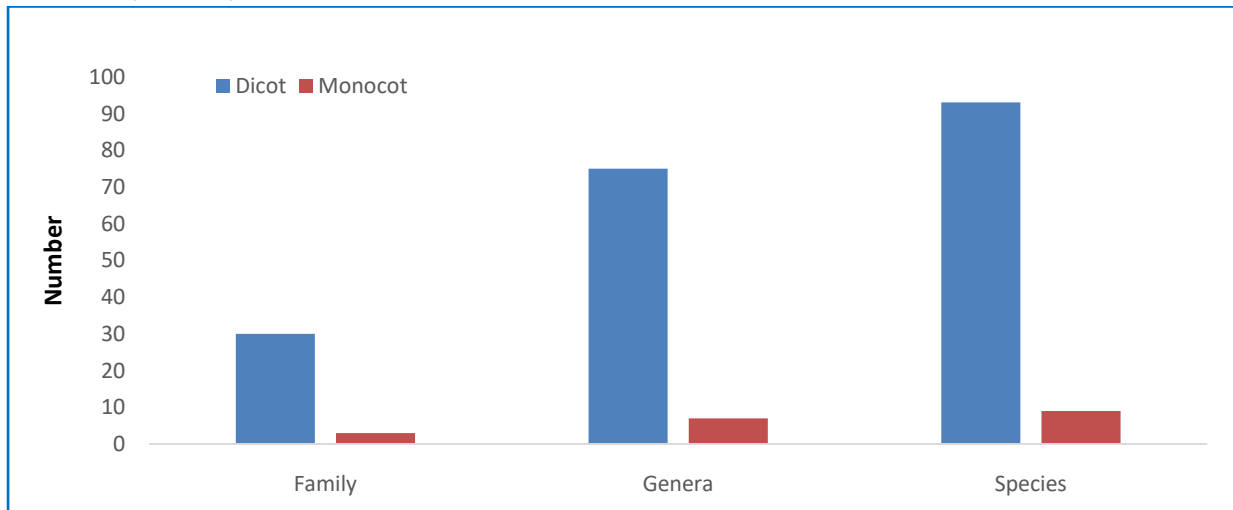


Fig. 4. Distribution of IAPS among families, genera & species.

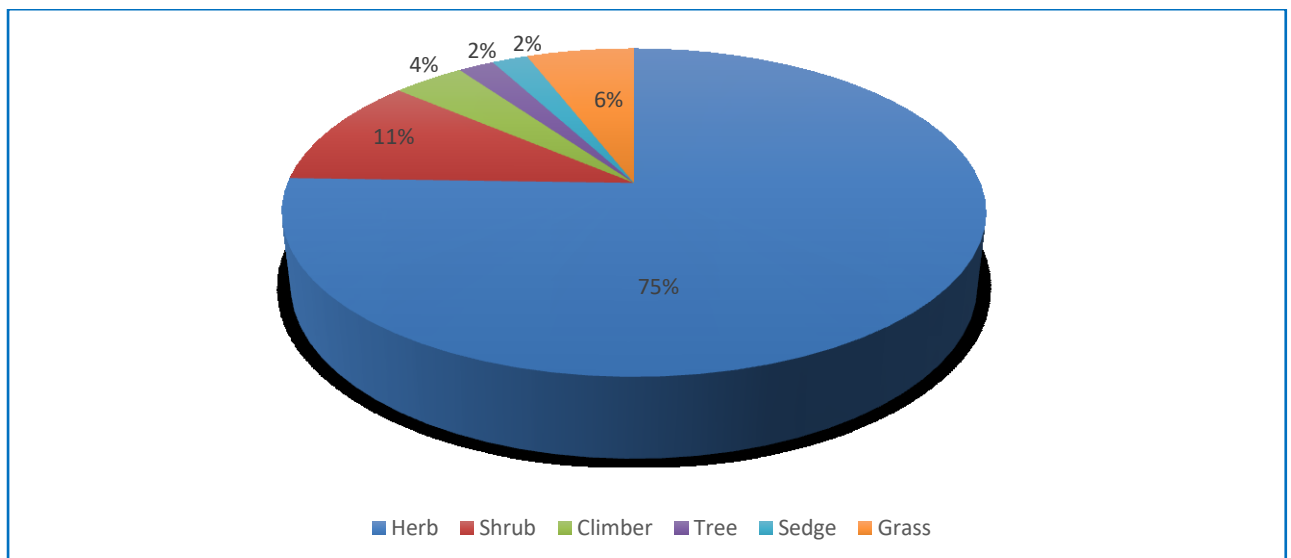


Fig. 5. Plant species on the basis of life form.

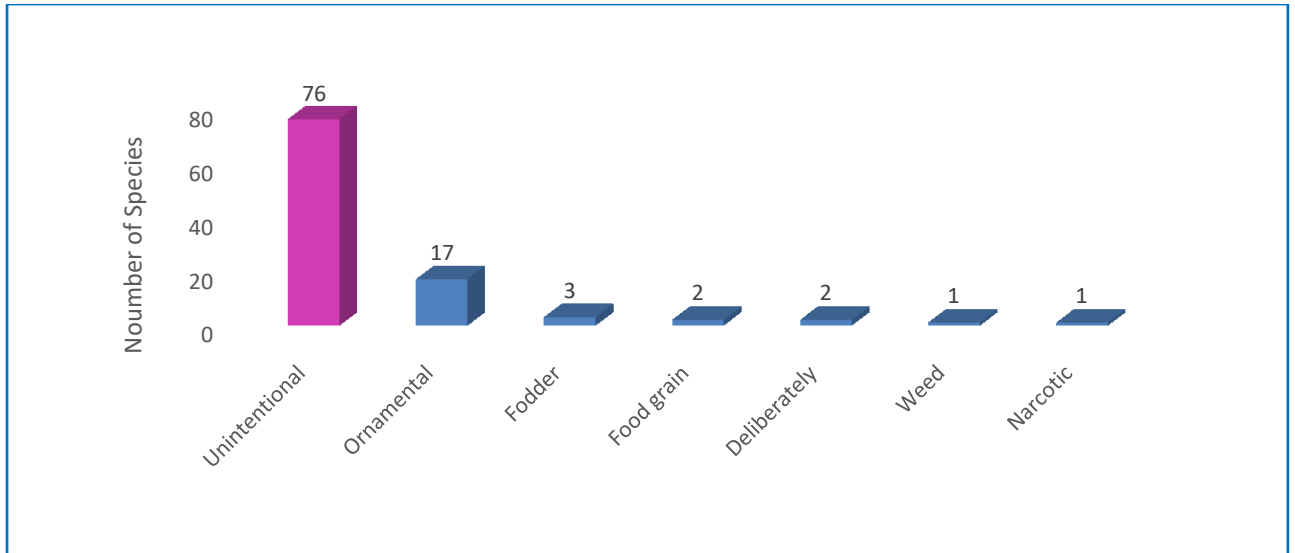


Fig. 6. Grouping of plant species on the basis of nativity.

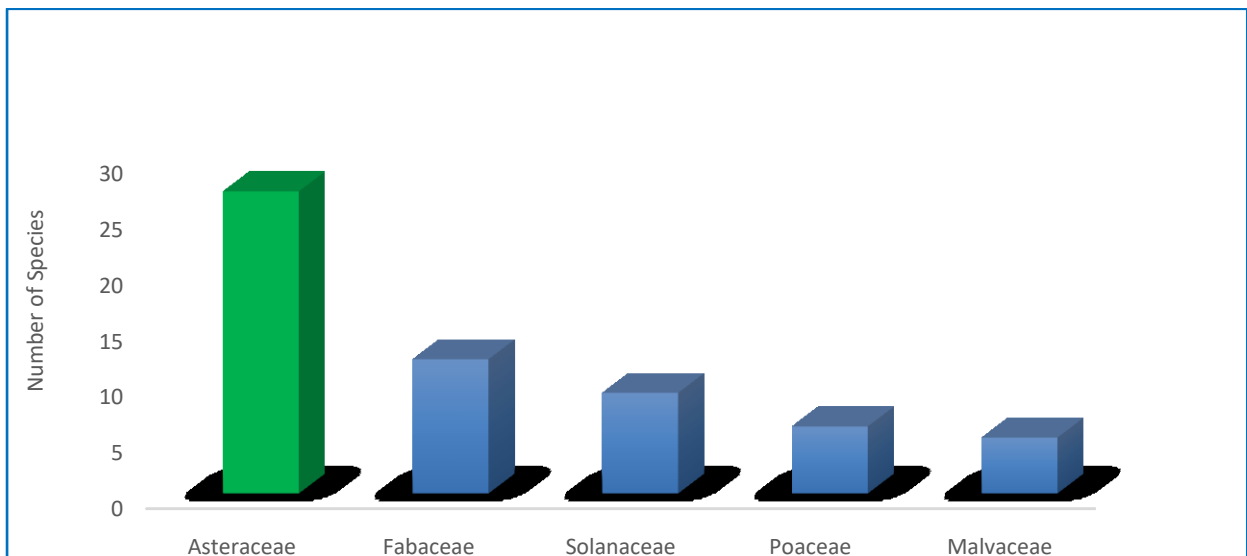


Fig.7. Distribution of species among top five families.

Some Invasive alien plant species recorded from Sikkim Himalaya with their invasion status in different altitudinal gradients:

Table 2. Phytosociological attributes of different plant species at 600 m-900 m altitudinal gradient.

SI NO.	Name of Species	frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageratina adenophora</i>	100.00	34.67	6.62	104.92
2	<i>Ageratum</i>	83.33	26.33	1.24	50.49
12	<i>Polygonum sp.</i>	41.67	8.00	0.22	17.53
7	<i>Oxyspora paniculata</i>	25.00	4.33	0.99	17.07
4	<i>Bidens pilosa</i>	33.33	4.67	0.60	15.92
5	<i>Lantana camara</i>	8.33	1.33	1.25	13.02
3	<i>Mikania micrantha</i>	25.00	5.00	0.17	10.96
6	<i>Polygonum sp.</i>	16.67	3.00	0.04	6.41
13	<i>Crassocephalum crepidiodes</i>	16.67	2.00	0.13	6.34
8	<i>Thysanolaena maxima</i>	8.33	0.67	0.40	5.60

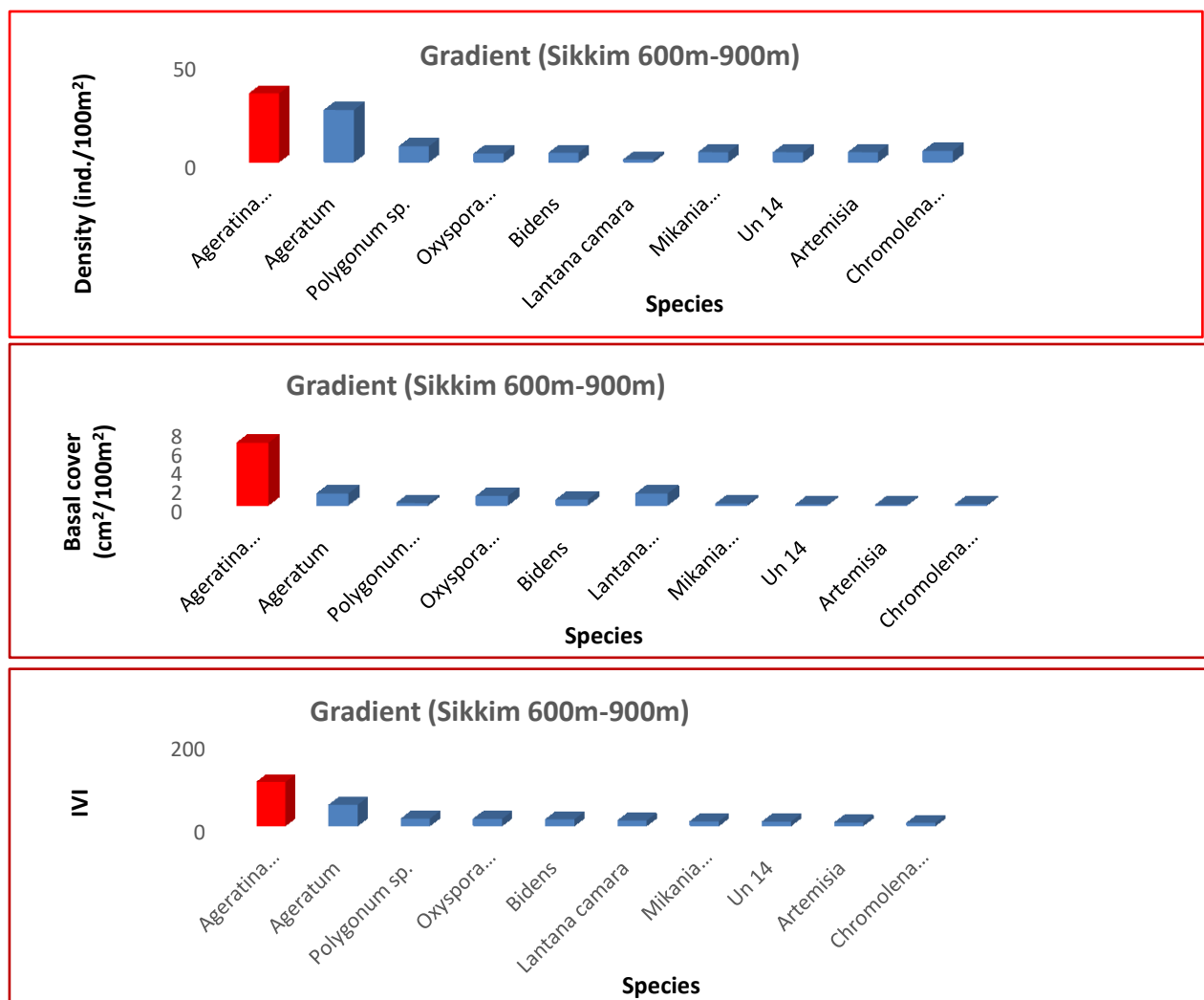


Fig. 8. Phytosociological attributes of different plant species at 600 m-900 m altitudinal gradient.

Table3 .Phytosociological attributes of different plant species at 900 m-1200 m altitudinal gradient.

SI NO.	Name of Species	frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageretina adenophora</i>	90.90	35.45	3.68	63.33
10	<i>Justicia adhathoda</i>	13.63	1.45	15.97	56.43
8	<i>Pilea scripta (Small)</i>	59.09	14.54	1.30	29.88
2	<i>Ageratum</i>	54.54	15.09	0.42	26.52
	<i>Chromlaena odorata</i>	31.81	9.27	1.32	19.43
9	<i>Artemisia vulgaris</i>	13.63	2.36	3.47	16.38
3	<i>Bidens</i>	40.90	6.18	0.61	16.20
16	<i>Polygonum sp.</i>	31.81	5.45	0.15	12.12
7	<i>Lantana camara</i>	4.54	0.72	2.35	9.32
6	<i>Mikania micrantha</i>	4.54	1.09	0.01	1.99

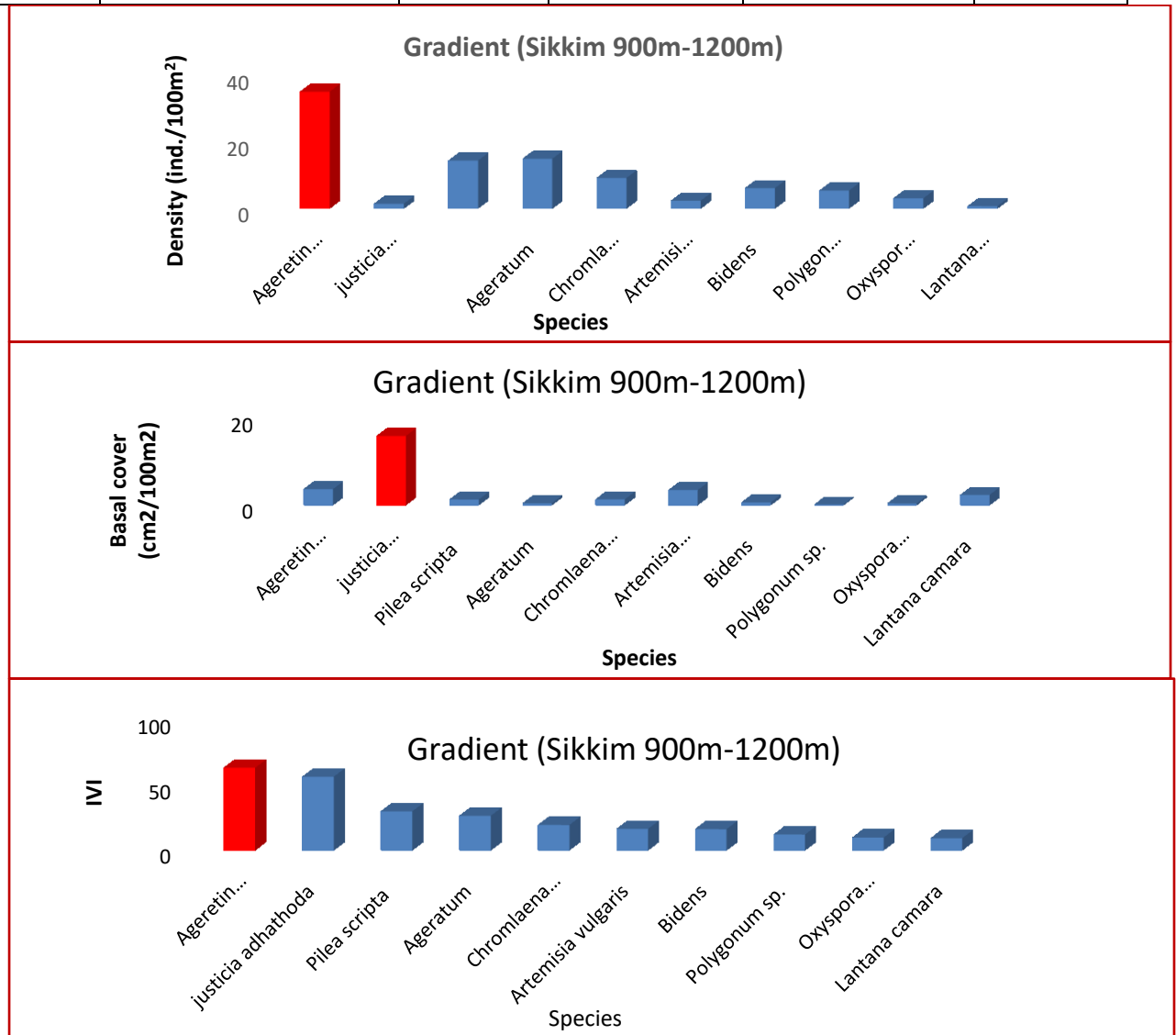


Fig.9. Phytosociological attributes of different plant species at 900 m-1200 m altitudinal gradient.

Table-4. Phytosociological attributes of different plant species at 1200 m-1500 m altitudinal gradient.

SI NO.	Name of Species	frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageretina adenophora</i>	90	33.6	11.25	76.57
7	<i>Lantana camara</i>	15	2.6	15.70	32.53
3	<i>Bidens</i>	40	10.2	4.82	28.712
9	<i>Artemisia vulgaris</i>	20	2	11.11	25.51
2	<i>Ageratum</i>	25	6	2.24	16.26
18	<i>Oxyspora paniculata</i>	20	2.8	3.69	14.04
5	<i>Chromlaena odorata</i>	20	5.6	1.83	13.93
4	<i>Artemesia nilagirca</i>	10	2.4	1.03	6.73
6	<i>Mikania micrantha</i>	5	1.4	0.05	2.80
8	<i>Pilea scripta</i>	10	2.6	1.03	6.94

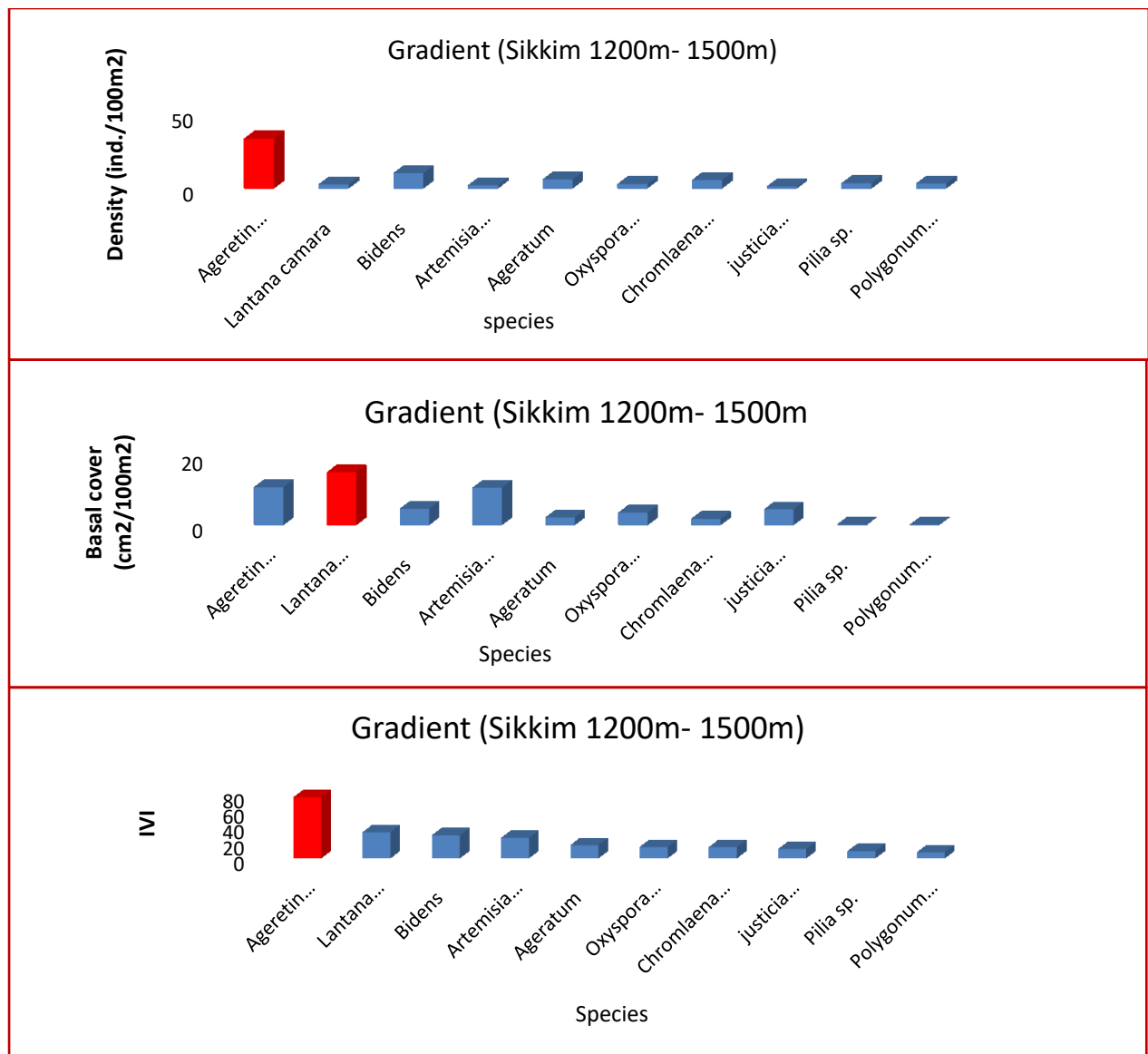


Fig.10. Phytosociological attributes of different plant species at 1200 m –1500 m altitudinal gradient.

Table 5. Phytosociological attributes of different plant species at 1500 m–1800 m altitudinal gradient.

SI NO.	Name of Species	Frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageratina adenophora</i>	100	40.52	9.86	87.69
7	<i>Oxyspora paniculata</i>	31.15	4.72	3.34	18.89
12	<i>Artemisia vulgaris</i>	32.79	6.1	1.36	17.46
4	<i>Bidens</i>	31.15	5.77	1.34	16.65
15	<i>Giardinia diversifolia</i>	8.2	1.64	6.69	15.36
13	<i>Pilea scripta</i>	26.23	4.59	0.56	12.74
21	<i>Rubus ellipticus</i>	14.75	1.77	3.69	12.02
2	<i>Ageratum</i>	16.39	2.95	1.17	9.46
6	<i>Chromolena odorata</i>	6.56	1.44	0.97	4.93
3	<i>Melissa axillaris</i>	6.56	1.31	0.63	4.21

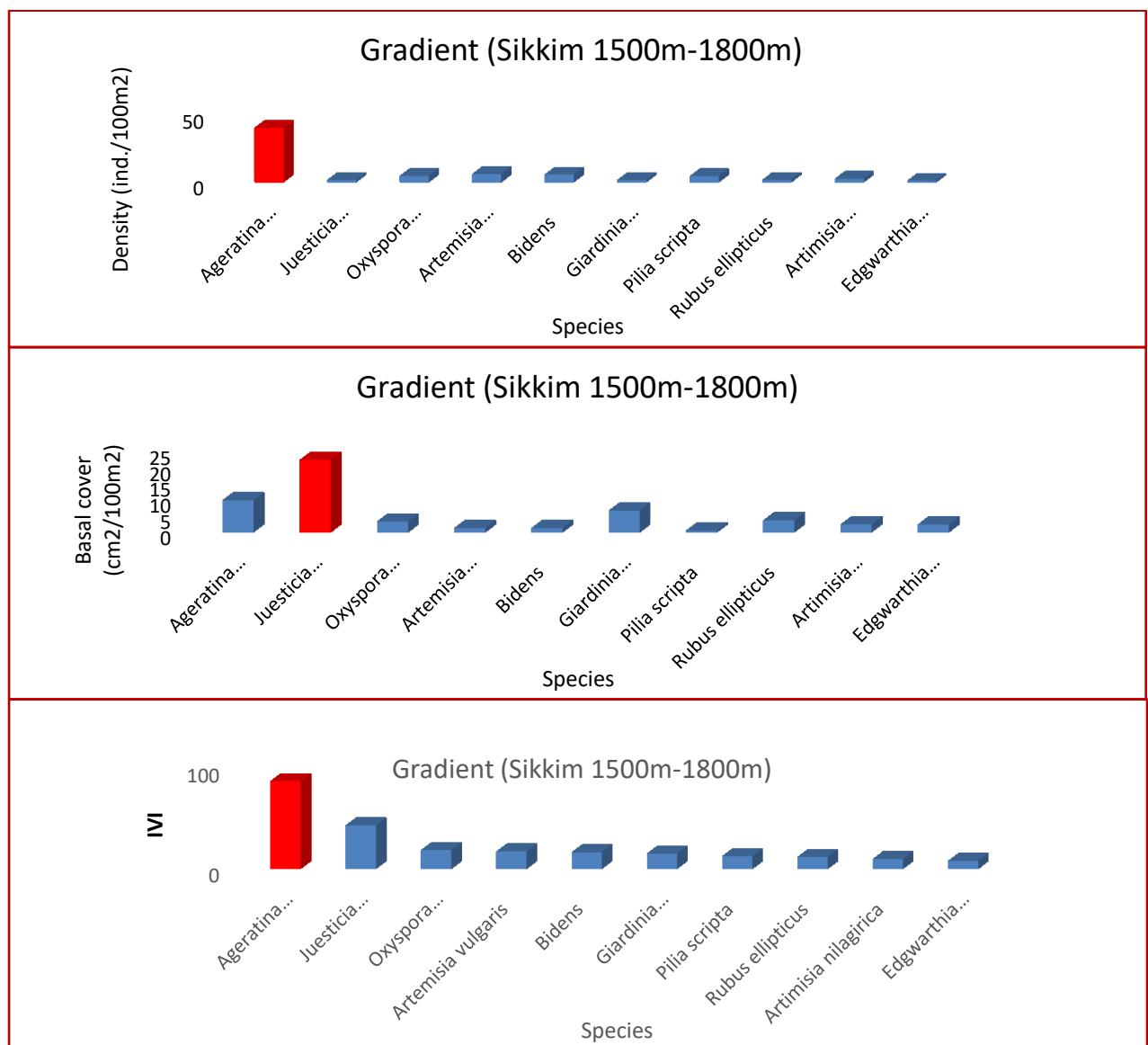


Fig.11-Phytosociological attributes of different plant species at 1500 m–1800 m altitudinal gradient.

Table-6. Phytosociological attributes of different plant species at 1800 m–2100 m altitudinal gradient.

SI NO.	Name of Species	frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageretina adenophora</i>	100	31.467	8.453	71.192
5	<i>Melissa axillaris</i>	33.33	9.06	0.11	19.60
6	<i>Pillia small</i>	20	12	0.13	19.23
3	<i>Bidens</i>	20	6.66	1.44	14.42
17	<i>Oxyspora paniculata</i>	26.66	2.93	2.53	13.08
9	<i>Artemisia vulgaris</i>	26.66	3.2	1.74	12.64
8	<i>Giardinia diversifolia</i>	6.66	0.8	8.99	11.13
2	<i>Ageratum</i>	13.33	3.2	1.37	8.60
10	<i>Laportea interupta</i>	13.33	3.46	1.78	9.27
4	<i>Artemesia nilagirca</i>	13.33	1.6	1.75	7.14

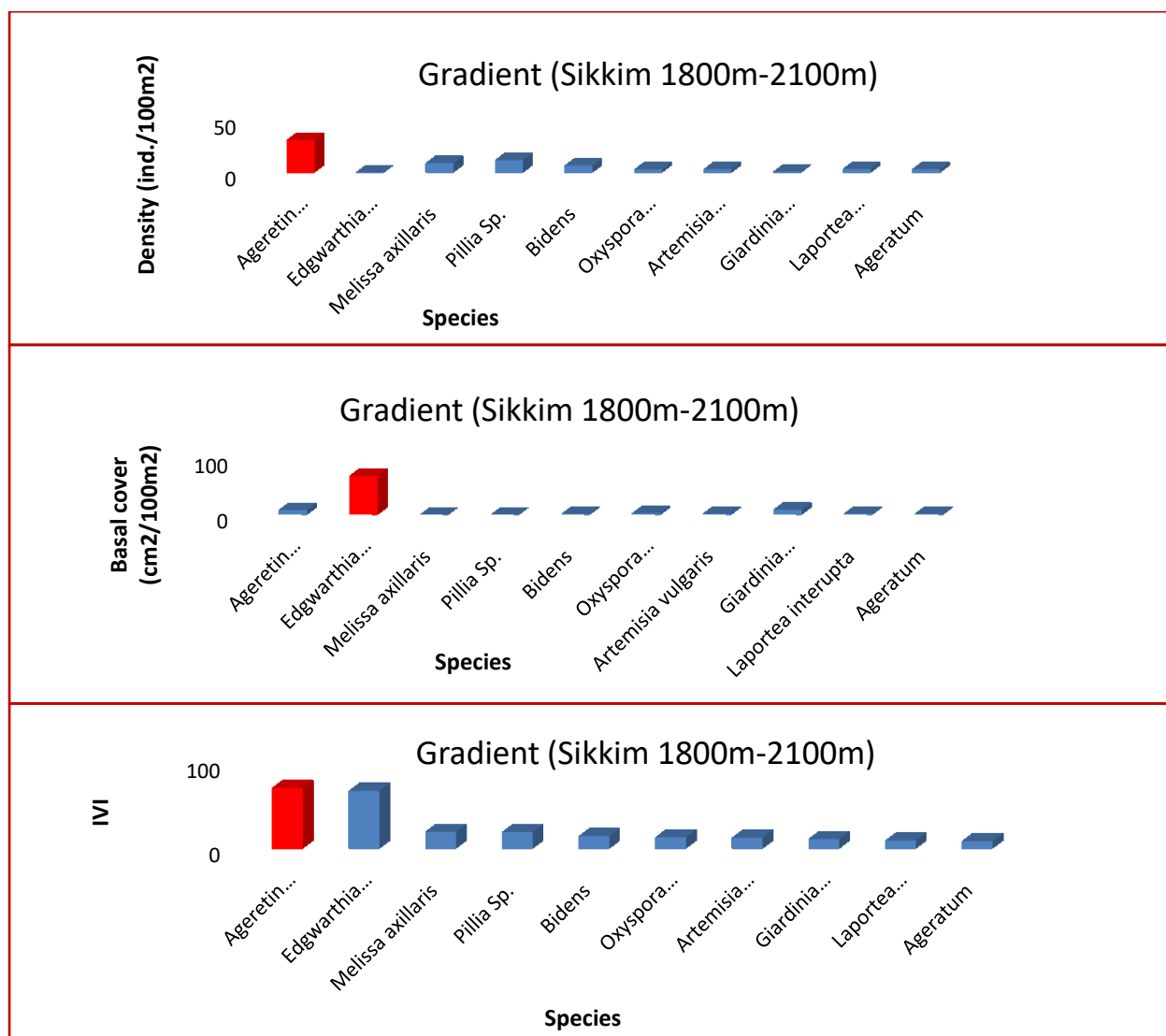


Fig. 12. Phytosociological attributes of different plant species at 1800 m–2100 m altitudinal gradient.

Table 7. Phytosociological attributes of different plant species at 2100 m–2400 m altitudinal gradient.

SI NO.	Name of species	Frequency (%)	Density (ind./100m ²)	Basal cover(cm ² /100m ²)	IVI
1	<i>Ageratina adenophora</i>	83.33	21.33	10.18	92.04
2	<i>Anaphilis sp.</i>	66.66	10.66	1.45	46.76
3	<i>Rubus lineatus</i>	33.33	6.66	6.76	39.28
4	<i>Artemesia vulgaris</i>	50	6	2.70	34.90
5	<i>Artemesia nilagirca</i>	16.66	2	2.91	16.10
6	<i>Calciolaria</i>	16.66	1.33	0.04	8.49
7	<i>Giardinia diversifolia</i>	16.66	5.33	20.95	62.42

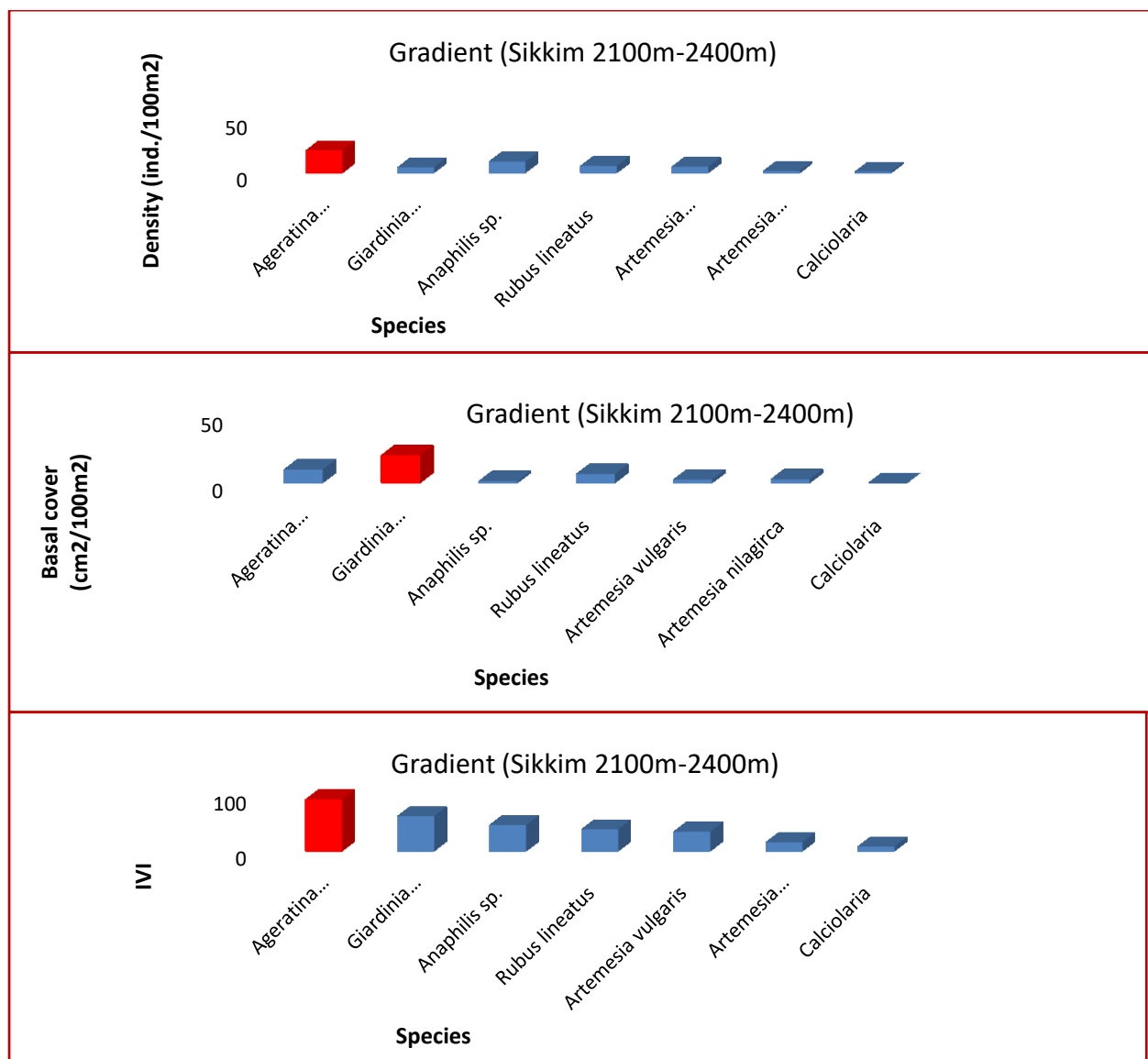


Fig. 13. Phytosociological attributes of different plant species at 2100 m–2400 m altitudinal gradient

Table-8. Phytosociological attributes of different plant species at 2400 m–2700 m altitudinal gradient.

SI NO.	Name os Species	frequency (%)	Density (ind./100m ²)	Basal cover(cm2/100m2)	IVI
1	<i>Artemisia vulgaris</i>	42.857	8.571	8.039	64.43
2	<i>Anaphilis sp.</i>	71.429	10.857	1.498	60.808
3	<i>Ageratina adenophora</i>	71.429	19.429	10.32	109.04
4	<i>Chromolena odorata</i>	14.286	0.571	0.065	7.76
5	<i>Giardinia diversifolia</i>	14.286	2.286	10.709	46.349
6	<i>Calciolaria</i>	14.286	2.286	0.052	11.614

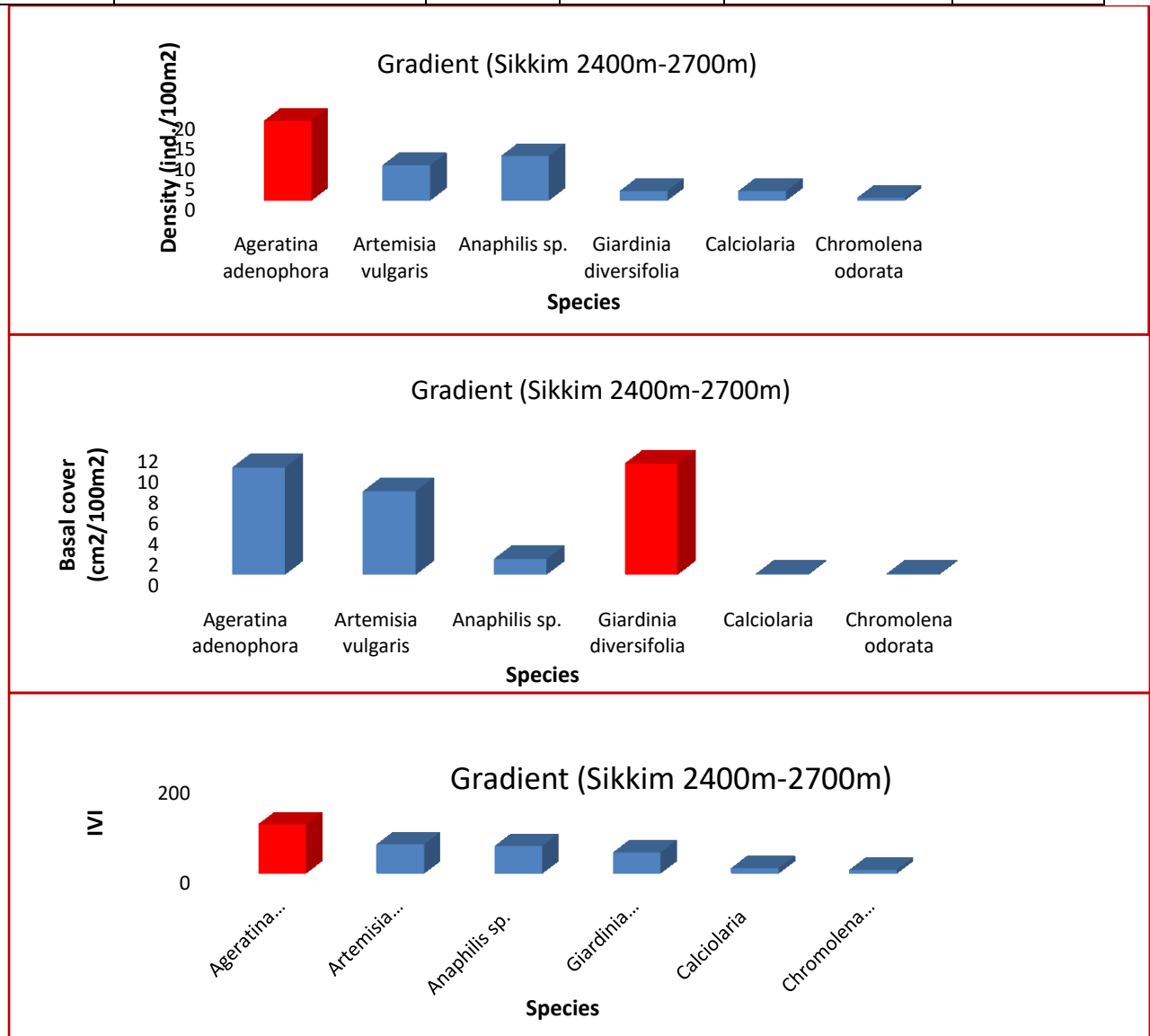


Fig. 14. Phytosociological attributes of different plant species at 2400 m–2700 m altitudinal gradient.

Table 9. Phytosociological attributes of different plant species at 1500 m–1800 m altitudinal gradient in Darjeeling.

Sl No	Name of Species	Frequency (%)	Density (ind./100m ²)	Basalcover (cm ² /100m ²)	IVI
1	<i>Ageratina adenophora</i>	100.00	64.667	4.034	100.84
2	<i>Un 2</i>	16.67	3.333	0.028	6.70
3	<i>Pelia sp.</i>	66.67	13.333	0.299	28.00
4	<i>Rubus ellipticus</i>	33.33	6.667	0.390	15.55
5	<i>Bidens pilosa</i>	33.33	6.667	0.147	13.99
6	<i>Cardamine flexuosa</i>	16.67	3.333	0.017	6.63
7	<i>Thysanolaena maxima</i>	16.67	3.333	0.182	7.69
8	<i>Justicia adhathoda</i>	50.00	10.000	7.023	64.64
9	<i>Un 6</i>	33.33	5.333	1.018	18.50
10	<i>Solanum sp.</i>	33.33	2.000	1.826	21.02
11	<i>Oxyspora paniculata</i>	16.67	2.000	0.523	8.81
12	<i>Laprotea interrupta</i>	16.67	4.000	0.092	7.65

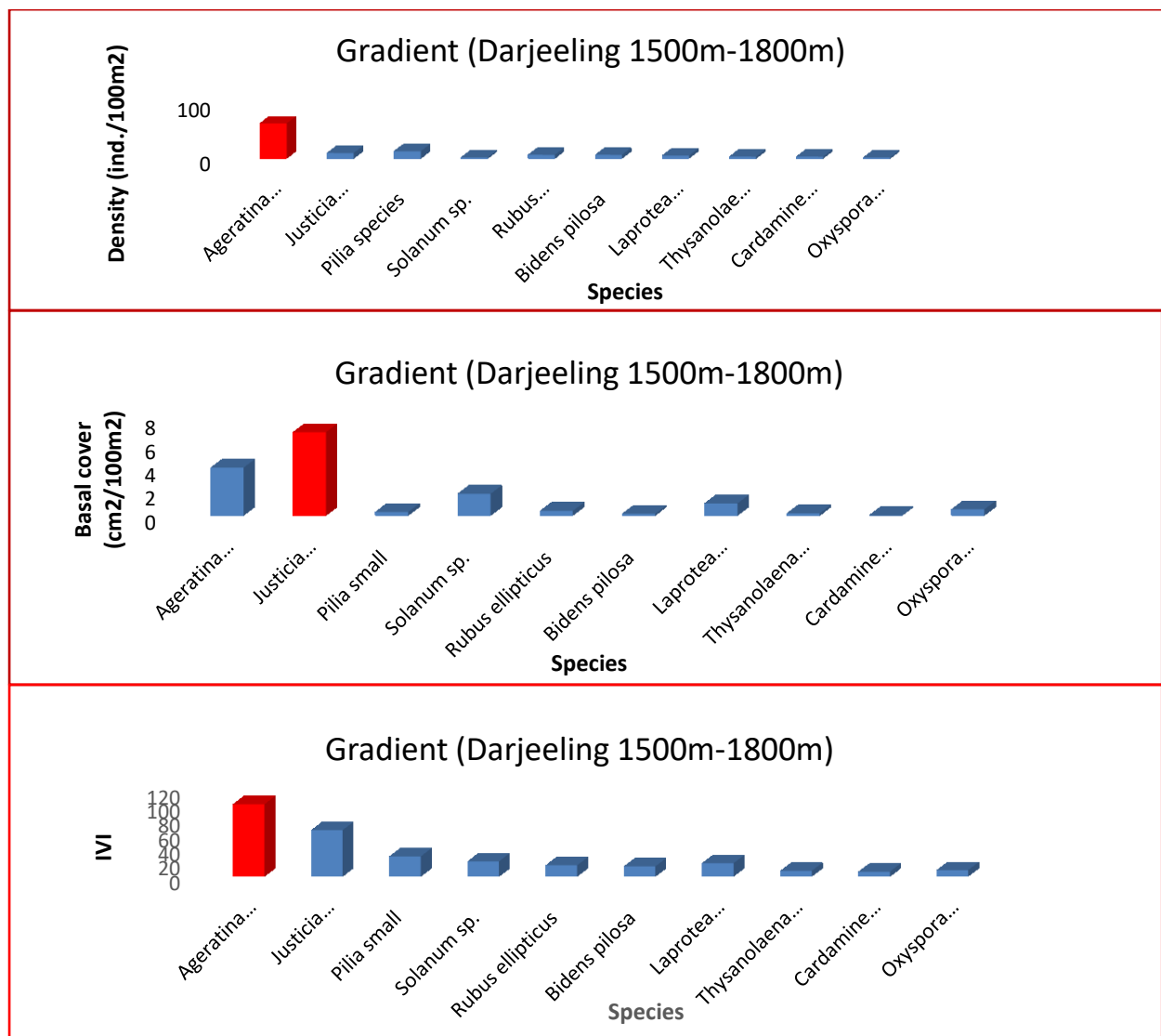


Fig. 15. Phytosociological attributes of different plant species at 1500 m-1800 m altitudinal gradient.

Table. 10. Phytosociological attributes of different plant species at 1800 m-2100 m altitudinal gradient in Darjeeling.

Sl No	Name of Species	Frequency (%)	Density (ind./100m ²)	Basalcover (cm ² /100m ²)	IVI
1	<i>Ageratinaadenophora</i>	100	42.5	26.46466575	146.9334
2	<i>oxysporapeniculata</i>	37.5	7	6.708767	36.68288
3	<i>Solanum sp.</i>	12.5	1	0.040192	4.751672
4	<i>Melissa axillaris</i>	12.5	5	0.489425694	10.26734
5	<i>Justicia adhathoda</i>	25	7.5	2.080790778	20.89661
6	<i>Eregron sp.</i>	37.5	9	0.058561	20.50128
7	<i>Artemisia sp.</i>	12.5	2	0.090432	5.959597
8	<i>Melissa axillaris</i>	37.5	7.5	0.061858	18.90609
9	<i>Calceolaria</i>	12.5	1	0.0157	4.684199
10	<i>Pseudonehalium affine</i>	12.5	1.5	0.05969925	5.340172
11	<i>Bidens</i>	12.5	2.5	0.098125	6.51555
12	<i>Pilia small</i>	37.5	7	0.13129125	18.56261

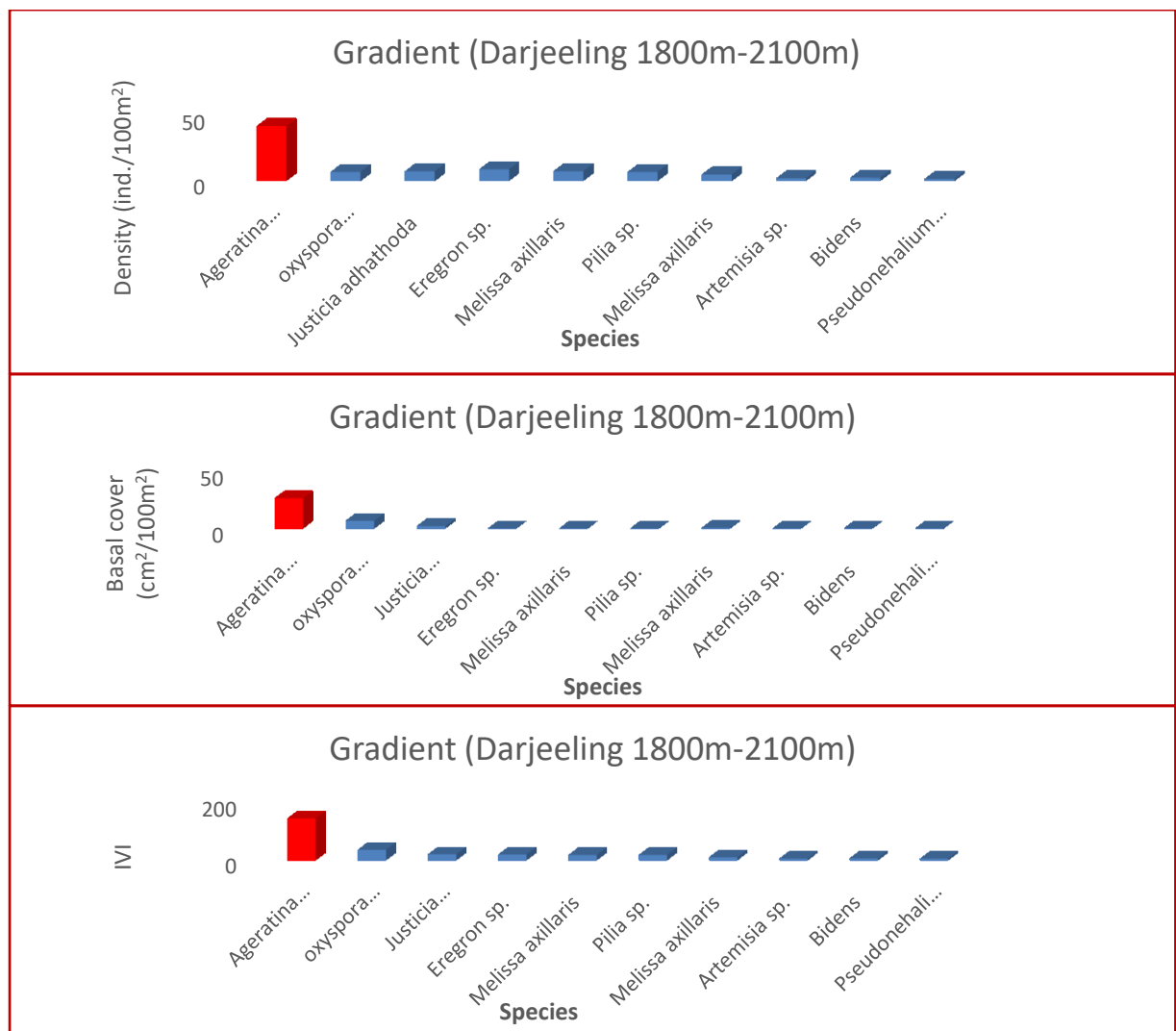


Fig. 16. Phytosociological attributes of different plant species at 1800 m-2100 m altitudinal gradient.

LIST OF PLANTS & DATA ANALYSIS
(Tripura & Mizoram)

List of Invasive Alien Plants In Mizoram & Tripura:

Sl.No.	Accepted names	Families	Taxonomic group	Taxonomic Sub-group	Himalayan State from which being reported	Nativity	Habit	Growth form	Mode of introduction	Habitats invaded
1.	<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob.	Asteraceae	AN	D	MZ	MEX	P	H	U	OF
2.	<i>Aeschynomene americana</i> L.	Papilionaceae	AN	D	MZ	TAM	P	H	U	AL
3.	<i>Ageratina adenophora</i> (Spreng.) R.M.King&H.Rob.	Asteraceae	AN	D	TR,MZ	MEX	P	H	O	OF
4.	<i>Ageratum houstonianum</i> Mill.	Asteraceae	AN	D	TR,MZ	TAM	A	H	O	AL
5.	<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	AN	D	TR,MZ	TAM	A	H	O	AL
6.	<i>Alternanthera paronychioides</i> St. Hill.	Amaranthaceae	AN	D	TR,MZ	TAM	A	H	U	AL
7.	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	AN	D	TR,MZ	TAM	A	H	U	RD
8.	<i>Alternanthera sessilis</i> (L.) DC.	Amaranthaceae	AN	D	TR,MZ	TAM	P	H	U	RD
9.	<i>Alternanthera ficoidea</i> (L.) Sm.	Amaranthaceae	AN	D	TR,MZ	TAM	A	H	U	RD
10.	<i>Amaranthus spinosus</i> L.	Amaranthaceae	AN	D	TR,MZ	TAM	A	H	U	RD
11.	<i>Argemone mexicana</i> L.	Papaveraceae	AN	D	TR	SAM	A	H	U	AL
12.	<i>Bidens pilosa</i> L.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	
13.	<i>Blainvillea acmella</i> (L.)Philipson	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	AL
14.	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	AL
15.	<i>Bougainvillea spectabilis</i> Willd.	Nyctaginaceae	AN	D	MZ	BRZ	P	L	OR	FL
16.	<i>Brassica oleracea</i> L.	Brassicaceae	AN	D	MZ	EUR	P	H	F	AL
17.	<i>Brunfelsia americana</i> L.	Solanaceae	AN	D	MZ	WI	P	SH	OR	FL
18.	<i>Brunfelsia hopeana</i> Benth.	Solanaceae	AN	D	MZ	TAM	P	SH	U	FL
19.	<i>Caesalpinia bonduc</i> (L.) Roxb.	Caesalpiaceae	AN	D	MZ	TAF	P	T	U	OF

20.	<i>Caladium bicolor</i> (Aiton) Vent.	Araceae	AN	M	MZ	SAM	P	H	OR	FL
21.	<i>Calliandra haematocephala</i> Hassk.	Mimosaceae	AN	D	MZ	TAM	P	SH	OR	FL
22.	<i>Callistemon citrinus</i> (Curtis) Skeels	Myrtaceae	AN	D	MZ	AUS	P	T	OR	FL
23.	<i>Calotropis gigantea</i> (L.) R. Br.	Asclepiadaceae	AN	D	MZ	TAF	P	SH	OR	FL
24.	<i>Calotropis procera</i> (Ait.) R. Br.	Asclepiadaceae	AN	D	MZ	TAF	P	SH	U	AL
25.	<i>Cardamine hirsuta</i> L.	Brassicaceae	AN	D	TR,MZ	TAM	P	H	U	AL
26.	<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	AN	D	MZ	MEX	P	T	OR	FL
27.	<i>Cassia fistula</i> L.	Caesalpiniaceae	AN	D	MZ	NAM	P	T	U	OF
28.	<i>Casuarina equisetifolia</i> L.	Casuarinaceae	AN	D	MZ	AUS	P	T	OR	OF
29.	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae	AN	D	MZ	TAM	P	H	OR	FL
30.	<i>Cayratia trifolia</i> (L.) Domin	Vitaceae	AN	D	MZ	AUS	P	CL	U	FL
31.	<i>Celosia argentea</i> L.	Poaceae	AN	M	TR,MZ	TAF	A	H	F	RD
32.	<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	AN	M	TR,MZ	TAM	A	H	U	RD
33.	<i>Chenopodium album</i> L.	Chenopodiaceae	AN	D	TR,MZ	Europe	A	H	F	RD
34.	<i>Chloris barbata</i> Sw.	Poaceae	AN	M	TR,MZ	TAM	P	GR	U	RD
35.	<i>Chromolaena odorata</i> (L.) R.M.King&H.Rob.	Asteraceae	AN	D	TR,MZ	SAM	P	H	U	RD
36.	<i>Cleome ruidosperma</i> DC.	Capparaceae	AN	D	TR	TAM	A	H	U	RD
37.	<i>Cleome viscosa</i> L.	Capparaceae	AN	D	TR	TAM	A	H	U	RD
38.	<i>Clerodendrum chinense</i> (Osbeck) Mabberley	Verbenaceae	AN	D	MZ	VIET	P	SH	U	AL
39.	<i>Corchorus aestuans</i> L.	Tiliaceae	AN	D	TR	SAM	A	H	U	AL
40.	<i>Corymbia maculata</i> (Hook.) K.D.Hill & L.A.S.Johnson	Myrtaceae	AN	D	MZ	AUS	P	T	OR	OF
41.	<i>Cosmos bipinnatus</i> Cav.	Asteraceae	AN	D	MZ	MEX	A	H	OR	FL
42.	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	AL
43.	<i>Crotalaria pallida</i> Ait.	Papilionaceae	AN	D	TR,MZ	TAM	A	H	U	AL
44.	<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	AN	D	TR,MZ	SAM	P	H	U	AL
45.	<i>Cupressus sempervirens</i> L.	Cupressaceae	AN	G	MZ	AUS	P	T	U	OF
46.	<i>Cuscuta chinensis</i> Lam.	Convolvulaceae	AN	D	TR,MZ	MED	P	CL	U	AL

47.	<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	AN	D	TR,MZ	MED	A	CL	U	RD
48.	<i>Cyanthillium cinereum</i> (L.) H.Rob.	Asteraceae	AN	D	TR,MZ	TAF	A	H	U	RD
49.	<i>Cyperus difformis</i> L.	Cyperaceae	AN	M	TR,MZ	TAM	A	SE	U	RD
50.	<i>Cyperus iria</i> L.	Cyperaceae	AN	M	TR,MZ	TAM	A	SE	U	OD
51.	<i>Datura metel</i> L.	Solanaceae	AN	D	TR	TAM	P	SH	U	OD
52.	<i>Datura stramonium</i> L.	Solanaceae	AN	D	TR,MZ	TAM	P	SH	U	OD
53.	<i>Delonix regia</i> (Hook.) Raf.	Caesalpinaceae	AN	D	MZ	MAD	P	T	OR	FL
54.	<i>Dombeya mastersii</i> Hook. f.	Sterculiaceae	AN	D	MZ	TAF	P	SH	OR	FL
55.	<i>Duranta erecta</i> L.	Verbenaceae	AN	D	MZ	MEX	P	SH	OR	FL
56.	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Chenopodiaceae	AN	D	MZ	TAM	P	H	U	FL
57.	<i>Echinochloa colona</i> (L.) Link	Poaceae	AN	M	TR,MZ	SAM	A	GR	U	OD
58.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	OD
59.	<i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	AN	M	TR,MZ	TAM	P	H	O	AQ
60.	<i>Emilia sonchifolia</i> (L.) DC. Ex DC.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	OD
61.	<i>Erigeron canadensis</i> L.	Asteraceae	AN	D	TR,MZ	SAM	A	H	U	RD
62.	<i>Erigeron karvinskianus</i> DC.	Asteraceae	AN	D	MZ	MEX	A	H	U	FL
63.	<i>Eryngium foetidum</i> L.	Apiaceae	AN	D	MZ	MEX	A	H	F	AL
64.	<i>Eschscholzia californica</i> Cham.	Papaveraceae	AN	D	MZ	MEX	P	H	U	AL
65.	<i>Eucalyptus 219uberose</i> Labill.	Myrtaceae	AN	D	MZ	AUS	P	T	OR	FL
66.	<i>Euphorbia milii</i> Des Moul.	Euphorbiaceae	AN	D	MZ	MD	P	H	OR	FL
67.	<i>Euphorbia pulcherrima</i> Willd. Ex Klotzsch.	Euphorbiaceae	AN	D	MZ	MEX	P	SH	OR	FL
68.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	AN	D	TR,MZ	TAM	A	H	U	OD
69.	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	AN	D	TR,MZ	TAM	P	H	U	OD
70.	<i>Galinsoga parviflora</i> Cav.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	OD
71.	<i>Glandularia canadensis</i> (L.) Small	Verbenaceae	AN	D	MZ	SAM	P	H	OR	AL
72.	<i>Gompherena serrata</i> L.	Amaranthaceae	AN	D	TR	TAM	A	H	U	OD
73.	<i>Grangea maderaspatana</i> (L.) Pori	Asteraceae	AN	D	MZ	SAM	P	H	U	AL

74.	<i>Hypoestes phyllostachya</i> Baker	Acanthaceae	AN	D	TR,MZ	SAF	A	H	U	AL
75.	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	AN	D	TR,MZ	TAM	A	H	U	OD
76.	<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	AN	M	TR,MZ	TAM	P	GR	U	AL
77.	<i>Indigofera trita</i> L.f.	Papilionaceae	AN	D	MZ	TAF	P	SH	U	AL
78.	<i>Ipomoea quamoclit</i> L.	Convolvulaceae	AN	D	TR,MZ	TAM	P	CL	O	AL
79.	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	AN	D	TR,MZ	TAM	P	SH	U	AL
80.	<i>Ipomoea hederifolia</i> L.	Convolvulaceae	AN	D	TR,MZ	TAM	A	CL	U	AL
81.	<i>Lantana camara</i> L.	Verbenaceae	AN	D	TR,MZ	TAM	P	H	O	AL
82.	<i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae	AN	D	TR,MZ	TAF	A	H	U	AL
83.	<i>Ludwigia adscendens</i> (L.) Hara.	Onagraceae	AN	D	TR,MZ	TAF	A	H	U	AL
84.	<i>Ludwigia perennis</i> L.	Onagraceae	AN	D	TR,MZ	TAF	A	H	U	AL
85.	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	AN	D	TR	TAM	A	H	U	OD
86.	<i>Mecardonia procumbens</i> (Mill.) Small	Scrophulariaceae	AN	D	TR,MZ	TNM	A	H	U	OD
87.	<i>Mikania micrantha</i> Kunth.	Asteraceae	AN	D	TR,MZ	SAM	P	CL	U	OD
88.	<i>Mimosa pudica</i> L.	Mimosaceae	AN	D	TR,MZ	BRZ	P	H	U	OD
89.	<i>Oxalis corniculata</i> L.	Oxalidaceae	AN	D	TR,MZ	EUR	P	H	U	OD
90.	<i>Parthenium hysterophorus</i> L.	Asteraceae	AN	D	TR,MZ	NAM	A	H	U	OD
91.	<i>Peperomia pellucida</i> (L.) Kunth	Piperaceae	AN	D	TR,MZ	SAM	A	H	U	AL
92.	<i>Physalis minima</i> L.	Solanaceae	AN	D	MZ	TAM	A	H	U	AL
93.	<i>Pilea microphylla</i> (L.) Liebm.	Urticaceae	AN	D	TR,MZ	SAM	A	H	U	AL
94.	<i>Pistia stratiotes</i> L.	Araceae	AN	M	TR,MZ	TAM	P	H	U	
95.	<i>Ricinus communis</i> L.	Euphorbiaceae	AN	D	TR	MED	P	SH	F	OD
96.	<i>Rorippa dubia</i> (Pers.) Hara.	Brassicaceae	AN	D	TR,MZ	TAM	A	H	U	OD
97.	<i>Ruellia 220uberose</i> L.	Acanthaceae	AN	D	TR,MZ	TAM	A	H	U	OD
98.	<i>Saccharum spontaneum</i> L.	Poaceae	AN	M	TR,MZ	TWA	P	GR	U	OD
99.	<i>Scoparia dulcis</i> L.	Scrophulariaceae	AN	D	TR,MZ	TAM	A	H	U	OD
100.	<i>Senna alata</i> (L.) Roxb.	Caesalpinaceae	AN	D	TR	SAM	P	SH	O	RD

101.	<i>Senna occidentalis</i> (L.) Link.	Caesalpiaceae	AN	D	TR	SAM	P	H	U	RD
102.	<i>Senna tora</i> (L.) Roxb.	Caesalpiaceae	AN	D	TR	SAM	A	H	U	RD
103.	<i>Sida acuta</i> Burm.f.	Malvaceae	AN	D	TR,MZ	TAM	A	H	U	OD
104.	<i>Solanum torvum</i> Sw.	Solanaceae	AN	D	TR,MZ	WI	P	SH	U	OD
105.	<i>Sonchus asper</i> (L.) Hill	Asteraceae	AN	D	TR,MZ	MED	A	H	U	OD
106.	<i>Sonchus oleraceus</i> (L.) L.	Asteraceae	AN	D	TR,MZ	MED	A	H	U	OD
107.	<i>Spermacoce hispida</i> L.	Rubiaceae	AN	D	TR,MZ	TAM	A	H	U	OD
108.	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Verbenaceae	AN	D	TR,MZ	TAM	A	H	U	AL
109.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	AN	D	TR,MZ	WI	A	H	U	AL
110.	<i>Tridax procumbens</i> (L.) L.	Asteraceae	AN	D	TR,MZ	CAM	A	H	U	AL
111.	<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	AN	D	TR,MZ	TAM	A	H	U	AL
112.	<i>Typha angustifolia</i> L.	Typhaceae	AN	M	MZ	TAM	P	GR	U	AL
113.	<i>Urena lobata</i> L.	Malvaceae	AN	D	TR,MZ	TAF	P	SH	U	AL
114.	<i>Xanthium strumarium</i> L.	Asteraceae	AN	D	TR,MZ	TAM	A	H	U	AL
115.	<i>Youngia japonica</i> (L.)DC.	Asteraceae	AN	D	MZ	SAM	A	H	U	AL

Abbreviations: Himalayan State from which being reported: MZ=Mizoram; **Taxonomic group:** AN=Angiosperms; **Taxonomic Sub-group :** D=Dicots, M=Monocots,G=Gymnosperms ; **Habit :** P= Perennial , A=Annual ; **Growth form:** H=Herb, SH=Shrub, GR=Grass, SE=Sedge, CL=Climber ; **Nativity:** TAM:-Tropical America, SAM:-South America, CAM:-CAM, TNM:-Tropical North America, TAF:-Tropical Africa, EAF:-Eastern Africa, NAM:- North America, SAF:-South Africa, WI:- WI, MEX:-Mexico, AUS:-Australia, EUR:-Europe, BRZ:-BRZ, MED:- MED; SWA= South West Tropical Asia , TWA = Tropical West Asia; **Mode of introduction:** U:-Unintentional, O:-Ornamental, F:-Food; **Habitats invaded:** AL:-Agricultural Lands, AQ-Aquatic habitat, OD:- Open disturbed, FL:-Fallow Land, OF-Open Forest., WL:-Wetland, RD-Roadside.

DATA ANALYSIS

Mizoram is a landlocked state in North East India & the fifth smallest state of India with 21,087 km². It extends from 21°56'N to 24°31'N, and 92°16'E to 93°26'E. The maximum north-south distance is 285 km, while maximum east-west stretch is 115 km. Mizoram has a mild climate, being relatively cool in summer 20-29 °C but progressively warmer, with summer temperatures crossing 30 degrees Celsius and winter temperatures ranging from 7 to 22 °C.. Protected areas studied in Mizoram are Phawngpui National Park (50 km²), Murlen National Park(290 km²), Lengteng Wildlife Sanctuary (120 km²) and Pualreng Wildlife sanctuary.

Spread over 10,491.69 km², Tripura is the third-smallest among the 29 states in the country. It extends from 22°56'N to 24°32'N, and 91°09'E to 92°20'E. Its maximum extent measures about 178 km from north to south, and 131 km east to west. Tripura is bordered by the country of Bangladesh to the west, north and south; and the Indian states of Assam to the north east; and Mizoram to the east. It is accessible by national highway passing through the Karimganj district of Assam and Mamit district of Mizoram.

The State of Tripura experiences Humid Sub-tropical type of climate. Relatively high temperature, occasional thunderstorms and wind velocities characterize the summer season, which extends from March end to mid May. The average maximum temperature is 34°C and average minimum temperature is 15°C. Protected areas studied in Tripura are Sepahijola Wildlife Sanctuary(18.53 km²), Gomati Wildlife sanctuary(389.54km²), Rowa Wildlife Sanctuary(0.86 km²) and Trishna wildlife sanctuary(163.08 km²) and Clouded Leopard National Park(5.08 km²).

During the study 104 and 78 Invasive or potential invasive alien plant species have been recorded from Mizoram and Tripura respectively till date. These plant species belong to 89 genera in 46 families in Mizoram and 63 genera in 25 families in Tripura respectively. Of these 93 species are dicots and 11 species are monocot in Mizoram whereas 67 species are dicots and 11 species are monocots in Tripura . The largest families include: Asteraceae with 23 species followed by amaranthaceae and convolvulaceae with 6 species each in Mizoram.

The most noxious invasive alien plant species observed in Tripura and Mizoram are *Mikania micrantha* Kunth.(Asteraceae) , *Ageratina adenophora* (Spreng.) King & Robinson. (Asteraceae), *Ageratum conyzoides* (L.)L.(Asteraceae), *Chromolaena odorata* (L.) R.M.King & H.Rob.(Asteraceae) , *Lantana camara* L. (Verbenaceae) , *Ageratum houstonianum* Mill.(Asteraceae) , *Bidens pilosa* L. (Asteraceae), *Alternanthera sessilis* (L.) R.Br. ex DC. (Amaranthaceae) , *Imperata cylindrica* (L.) Raeusch , *Ipomoea carnea* Jacq (Convolvulaceae) and *Urena lobata* L.(Malvaceae).

Table-1: Number of taxa reported from the two Himalayan States

Taxa	Mizoram	Tripura
No. of Families	46	25
No. of Genera	89	63
No. of Species	104	78

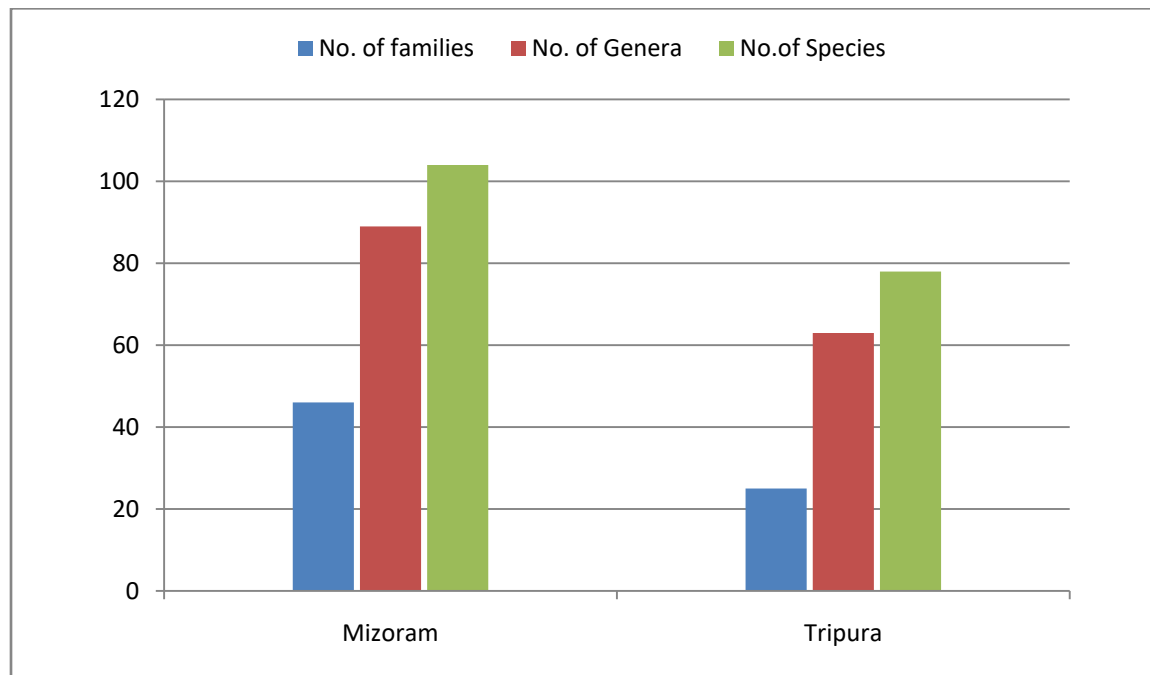


Table-2: Characterization of plant species on the basis of plant group.

Plant Group	Mizoram	Tripura
Dicots	93	67
Monocots	11	11

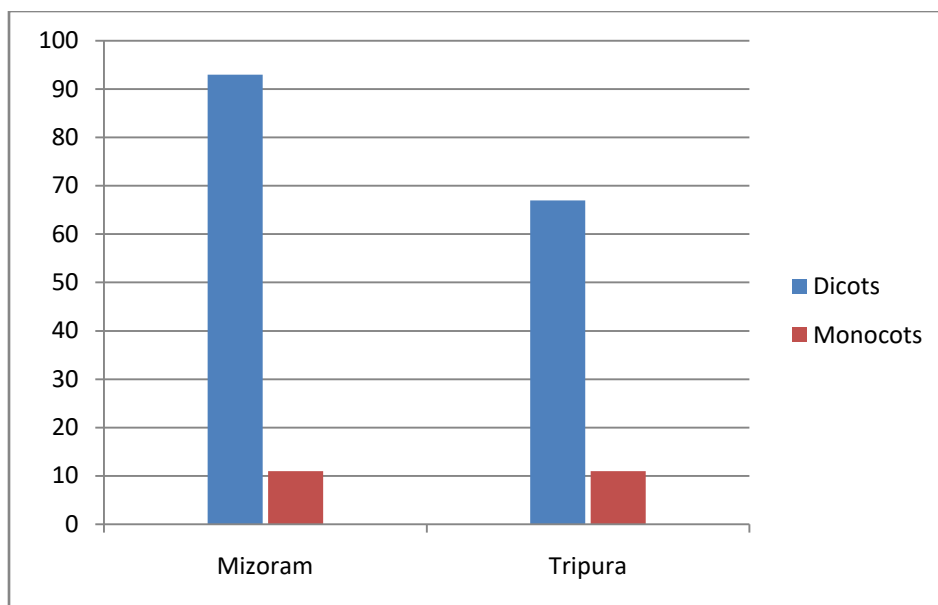


Fig. 2. Characterization of plant species on the basis of plant group.

Table-3: Characterization of plant species on the basis of life span

Life Span	Mizoram	Tripura
Annual	58	22
Perennial	46	24

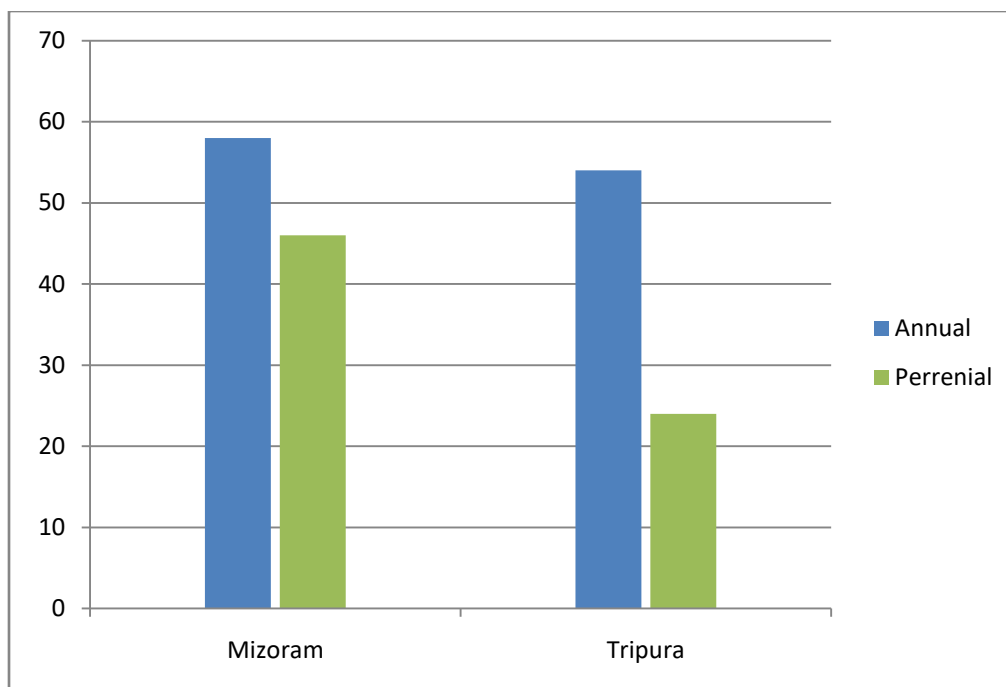


Fig. 3. Characterization of plant species on the basis of life span.

Table:5 Characterization of plant species on the basis of native places:

Native Place	Mizoram	Tripura
Tr. America	51	40
S.America	16	16
Mexico	9	6
Europe	7	7
Mediterranean	5	4
West Indies	3	2
Tr.Africa	11	3

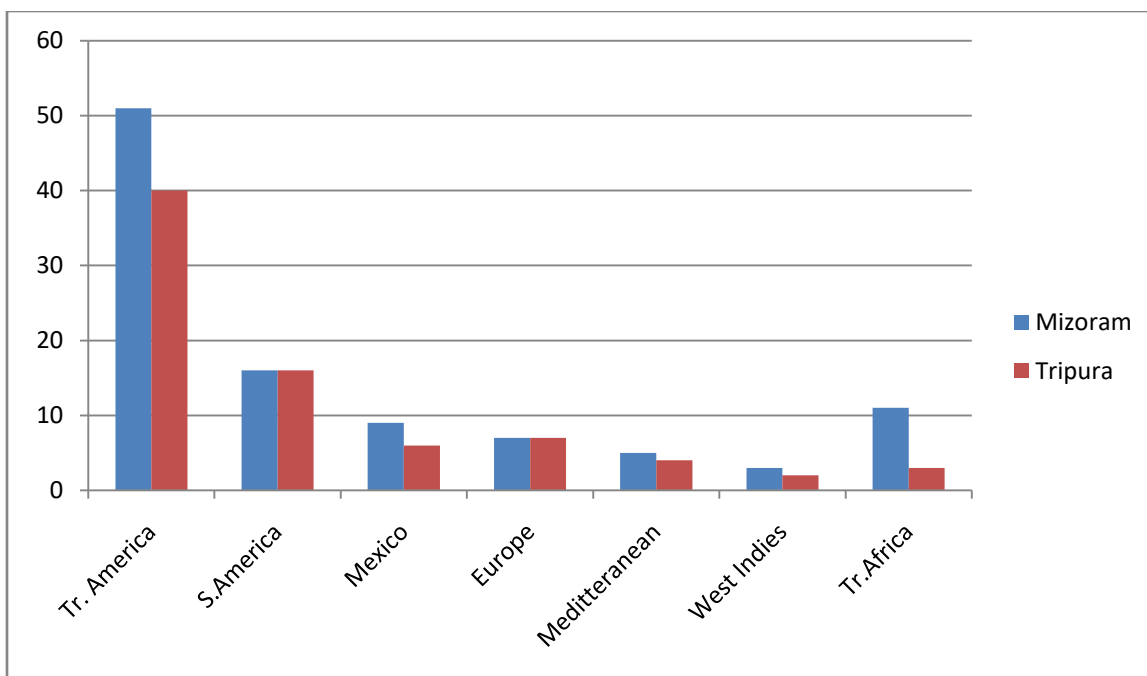


Fig-4: Characterization of plant species on the basis of native places:

Table-5: Characterization of plant species on the basis of growth form

Growth Form	Mizoram	Tripura
Herbs	75	62
Shrubs	17	8
Climbers	6	5
Grasses	6	3

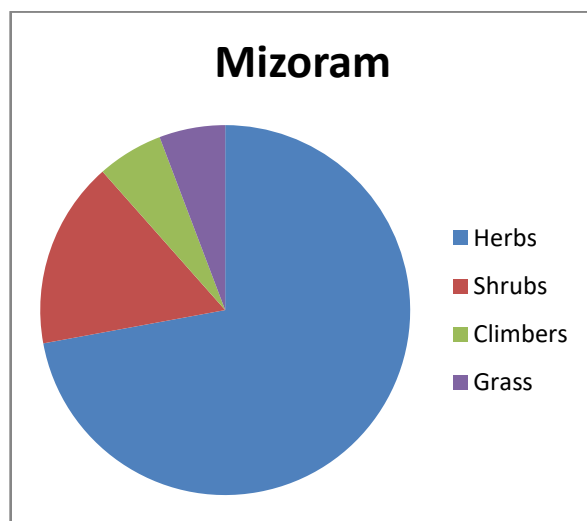


Fig-5a: Characterization of plant species on the basis of growth form in Mizoram

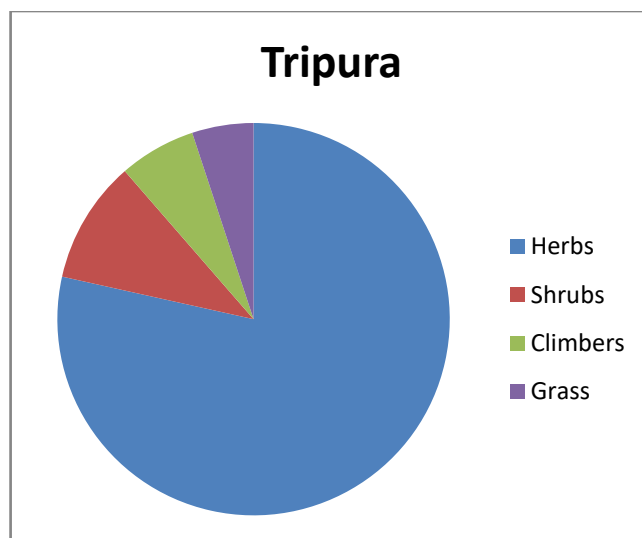


Fig-5b:Characterization of plant species on the basis of growth form in Tripura

Table-6a:Top five dominant family in Mizoram state.

Sr.No	Family name	No. of Genus	No. of species
1.	Asteraceae	21	23
2.	Amaranthaceae	3	6
3.	Convolvulaceae	3	6
4.	Caesalpinaceae	7	7
5.	Poaceae	6	7

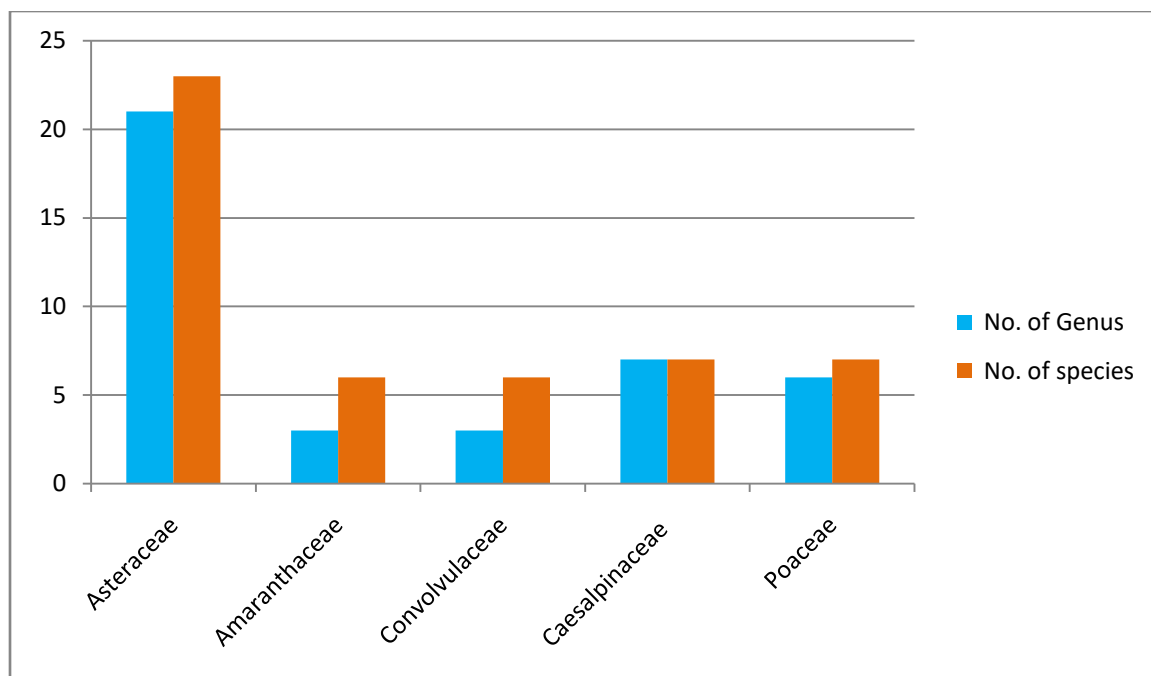


Fig-6a: Top five dominant families in Mizoram state.

Table-6b: Top five dominant family in Tripura state.

Sr.No	Family name	No. of Genus	No. of species
1.	Asteraceae	18	20
2.	Amaranthaceae	3	6
3.	Convolvulaceae	3	6
4.	Poaceae	5	5
5.	Solanaceae	3	3

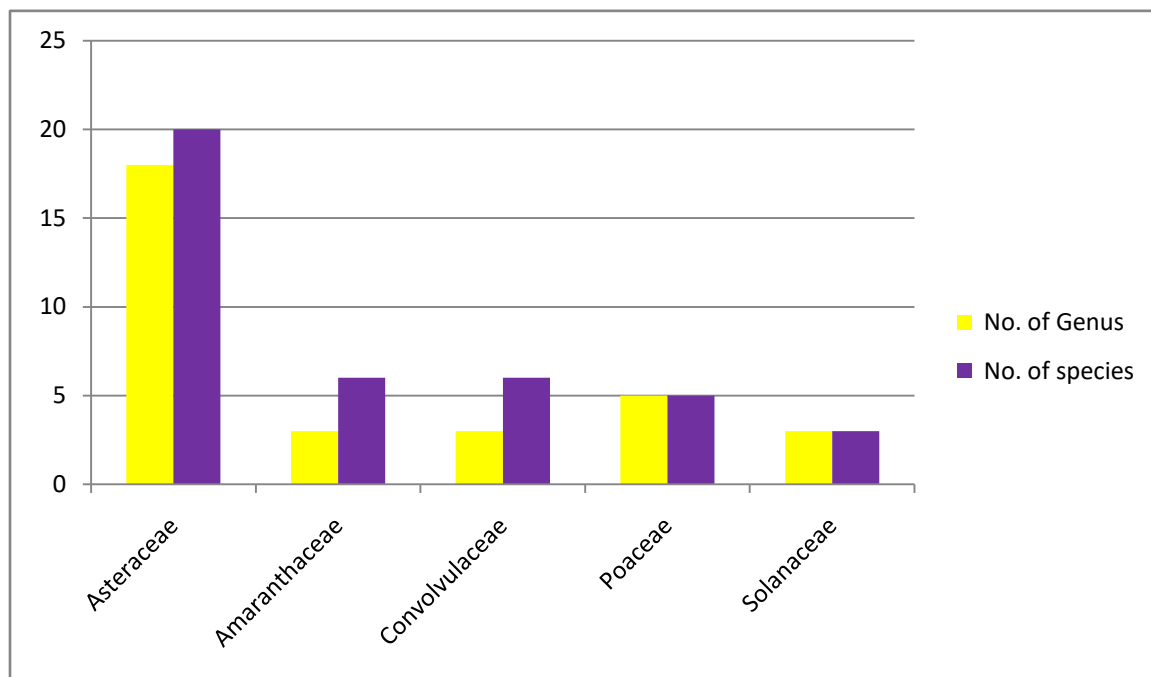


Fig-6b: Top five dominant families in Tripura state

Table-7a: Some Invasive alien plant species recorded from **Mizoram** with their Invasion status

Name of the Species	Frequency	Density	Abundance	RF	RD	Rdo	IVI
<i>Ageratina adenophora</i>	90	23.1	25.67	20.93	19.68	31.90	72.51
<i>Chromolaena odorata</i>	80	35.6	44.5	18.18	34.27	12.29	64.74
<i>Ageratina riparia</i>	80	20	25	18.60	19.17	22.75	60.52
<i>Mikania micrantha</i>	80	22.5	28.12	13.33	12.74	17.42	43.50
<i>Lantana camara</i>	60	8.4	14	13.64	10.78	10.70	35.12
<i>Bidens pilosa</i>	50	21.5	43	8.33	19.48	3.05	30.87
<i>Ageratum houstonianum</i>	30	3.5	11.67	5.77	9.98	11.31	27.05
<i>Ageratum conyzoides</i>	50	11	22	8.33	9.96	8.49	26.79
<i>Imperata cylindrica</i>	50	12.5	25	8.33	11.32	4.40	24.06
<i>Alternanthera sessilis</i>	50	1.3	2.6	8.33	1.17	1.64	11.15

Table-7b: Some Invasive alien plant species recorded from **Tripura** with their Invasion status

Name of the Species	Frequency	Density	Abundance	RF	RD	Rdo	IVI
<i>Mikania micrantha</i>	80	24	30	14.81	18.33	20.94	54.09
<i>Chromolaena odorata</i>	70	18	25.71	12.96	19.83	16.94	49.74
<i>Lantana camara</i>	50	15	30	9.25	22.39	17.95	49.61
<i>Ageratum conyzoides</i>	50	13.5	27	9.25	17.91	9.90	37.08
<i>Ipomea carnea</i>	40	8	20	7.40	9.51	15.01	31.93
<i>Imperata cylindrica</i> .	60	5.5	9.16	11.11	3.73	1.77	16.61

<i>Urena lobata</i>	60	3.8	6.33	11.11	3.26	5.29	19.66
<i>Ageratum houstonianum</i>	50	1.5	3	9.25	1.67	3.29	14.23
<i>Bidens pilosa</i>	50	1.3	2.6	9.25	1.45	1.77	12.48
<i>Saccharum spontaneum</i>	30	1	3.33	5.55	1.86	7.09	14.51

Table-8: Altitudinal distribution and IVI of invasive alien vascular plant species recorded in Mizoram during April–June, 2019

		IVI FOR RESPECTIVE INVASIVE ALIEN VASCULAR PLANT SPECIES IN MIZORAM								
Elevation range (m asl)	LOCALITY	AA	AC	CO	LC	MM	IH	AH	TD	BP
500–800	Near Melthum, Aizawl	44.45	33.07	–	32.25	44.48	–	40.48	66.71	–
	Near MZU campus, Aizawl	50.21	–	35.02	–	60.17	19.27	–	29.54	35.12
801–1100	Dampa Tiger Reserve	–	55.60	–	–	39.75	–	–	–	–
1101–1400	West Phaileng	–	–	62.74	35.12	37.17	–	–	–	–
1401–1700	Sangau	59.78	16.77			54.05	–	27.05		20.74
	S.vanlaiphai	103.12	–	64.74	43.11		–	78.38	–	–
1700–2200	Tahtlang, Near Sangau	60.02	–	–	–	36.72	–	–	–	–
	Phawngpui National Park	59.30	28.39	55.01	–	59.64	–	16.52	–	55.50
AA- <i>Ageratina adenophora</i> , AG- <i>Ageratum conyzoides</i> , CO- <i>Chromolaena odorata</i> , LC- <i>Lantana camara</i> , MM- <i>Mikania micrantha</i> , IH- <i>Ipomoea hederifolia</i> , AH- <i>Ageratum houstonianum</i> , TD- <i>Tithonia diversifolia</i> , BP- <i>Bidens pilosa</i> .										

Table-9: Altitudinal distribution and IVI of invasive alien vascular plant species recorded in Mizoram during July-December, 2019

		PLANT NAME									
Elevation range (m asl)	LOCALITY	AA	AC	CO	LC	MM	IH	AH	TD	BP	HP
500–800	Aizawl	78.55	35.52	55.33	58.95	61.01	43.64	34.05	52.02	47.21	43.36
801–1100	Sialsuk	52.12	50.27	71.60	–	71.68	44.32	49.90	60.26	40.63	–
1101–1400	Darzo	66.23	28.38	57.58	55.49	61.25	43.41	–	–	31.03	33.64
1401-1700	Hnathial	64.12	57.241	58.36	–	35.22	–	52.272	38.25	42.010	22.285
1701–2200	Sangau	81.40	30.38	52.19	54.23	12.52	34.01	–	–	50.25	47.73
AA-Ageratina adenophora, AG-Ageratum conyzoides, CO-Chromolaena odorata,LC-Lantana camara,MM-Mikania micrantha,IH-Ipomoea hederifolia,AH-Ageratum houstonianum,TD-Tithonia diversifolia,BP-Bidens pilosa,MP-Mimosa pudica,HP-Hypoestis phyllostachya.											

Table-10: Altitudinal distribution and IVI of invasive alien vascular plant species recorded in Mizoram during January–March, 2020.

		PLANT NAME									
Elevation range (m asl)	LOCALITY	AA	AC	CO	LC	MM	IH	AH	TD	BP	MP
500–800	Near Melthum, Aizawl	78.55	–	55.33	58.95	47.55	43.64	28.70	60.06	42.95	25.14
801–1100	Sialsuk	77.21	50.27	56.14	–	72.04	–	52.46	35.41	41.91	–
1101–1400	S.vanlaiphai	77.11	20.98	53.45	69.72	60.76	41.85	–	–	27.54	28.87
1401-1700	Sententfiang	66.86	–	23.78	31.22	38.57	–	45.33	–	37.91	44.32
1701–2200	Sangau	67.14	21.82	45.26	45.39	45.39	33.99	–	–	–	21.71
	Phawngpui National Park	58.33	38.44	–	–	–	–	41.50	–	31.95	
<p>AA-<i>Ageratina adenophora</i>, AG-<i>Ageratum conyzoides</i>, CO-<i>Chromolaena odorata</i>, LC-<i>Lantana camara</i>,MM-<i>Mikania micrantha</i>,IH-<i>Ipomoea hederifolia</i>,AH-<i>Ageratum houstonianum</i>,TD-<i>Tithonia diversifolia</i>,BP-<i>Bidens pilosa</i>,MP-<i>Mimosa pudica</i>.</p>											

LIST OF PLANTS & DATA ANALYSIS
(Arunachal Pradesh, Nagaland & Manipur)

List of Established and New Invasive Alien Vascular Plant Species (including potentially invasive) recorded in Arunachal Pradesh (AP), Manipur (MN) and Nagaland (NL).

Sl. No.	Name of the IAVPS	Vernacular/ Local name	Family	Taxonomic group	Taxonomic sub group	Life-form	Lifespan	Nativity	Established/ New	Purpose of Introduction	State of occurrence
1	<i>Acanthospermum hispidum</i> DC	Bristly starbur	Asteraceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP
2	<i>Achyranthes aspera</i> L.	Prickly chaff flower	Amaranthaceae	AN	Dicot	Herb	Perennial	Asia/Africa	New	Ui	AP, MN
3	<i>Acmella ciliata</i> (Kunth)	Toothache plant	Asteraceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP, MN
4	<i>Acmella uliginosa</i> (Swartz)	Marsh para cress	Asteraceae	AN	Dicot	Herb	Annual	Africa, America	New	Ui	AP, MN
5	<i>Ageratina adenophora</i> (Spreng.) King & H. Rob.	Crofton weed	Asteraceae	AN	Dicot	Herb	Perennial	South America	Established	Ui	AP, MN, NL
6	<i>Ageratina riparia</i> (Regel) R.M.King & H.Rob.	Creeping crofton weed	Asteraceae	AN	Dicot	Herb	Perennial	South America	New	Ui	MN
7	<i>Ageratum conyzoides</i> L.	Billygoat-weed	Asteraceae	AN	Dicot	Herb	Annual	South America	Established	O	AP, MN, NL
8	<i>Ageratum houstonianum</i> Mill.	Floss flower/Blue mink	Asteraceae	AN	Dicot	Herb	Annual	South America	Established	O	AP, MN, NL
9	<i>Alternanthera ficoidea</i> (L.) P.Beauv.		Amaranthaceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP
10	<i>Alternanthera philoxeroides</i> (Mart.)	Alligator weed	Amaranthaceae	AN	Dicot	Herb	Annual	South America	New	Ui	MN, NL

	Griseb.										
11	<i>Alternanthera sessilis</i> (L.) DC.	Dwarf copperleaf	Amaranthaceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP
12	<i>Arundo donax</i> L.	Giant reed	Poaceae	AN	Monocot	Grass	Perennial	Asia	New	Ui	MN
13	<i>Asclepias curassavica</i> L.		Apocynaceae		Dicot	Herb	Perennial	South America	New	Ui	MN
14	<i>Axonopus compressus</i> (Sw.) P.Beauv.	Blanket grass	Poaceae	AN	Monocot	Grass	Perennial	South America	Established	Ui	AP, MN
15	<i>Bidens pilosa</i> L.	Black-jack/ Beggar's tick	Asteraceae	AN	Dicot	Herb	Annual	South America	Established	Ui	AP, MN, NL
16	<i>Bombax ceiba</i> L.	Red cotton tree	Malvaceae	AN	Dicot	Tree		Africa, Australia, Asia	New	P	AP, NL, MN
17	<i>Broussonetia papyrifera</i> (L.) L'Hér. ex Vent.	Paper mulberry	Moraceae	AN	Dicot	Tree		Asia	New	P	NL
18	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob.	Siam weed	Asteraceae	AN	Dicot	Shrub	Perennial	South America	Established	Ui	AP, MN, NL
19	<i>Commelina benghalensis</i> L.	Benghal dayflower/ Tropical spiderwort	Commelinaceae	AN	Monocot	Herb	Perennial	Asia and Africa	Established	Ui	AP
20	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore		Asteraceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP, MN, NL
21	<i>Crotalaria pallida</i> Aiton	Giant striata	Fabaceae	AN	Dicot	Shrub	Annual	Tropical America	New	Ui	AP, MN
22	<i>Cuphea carthagenensis</i> (Jacq.) J.F. Macbr.	Colombian waxweed	Lythraceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP, MN
23	<i>Cuscuta reflexa</i> Roxb.	Giant dodder	Convolvulaceae	AN	Dicot	Climber	Annual		New	O	AP

24	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	Poaceae	AN	Monocot	Grass	Perennial	Africa	Established	Ld	AP, MN, NL
25	<i>Cyperus esculentus</i> L.		Cyperaceae	AN	Monocot	Grass	Perennial	Africa	New	Ui	AP, MN
26	<i>Eleusine indica</i> (L.) Gaertn.	Indian goosegrass	Poaceae	AN	Monocot	Grass	Annual	Tropical & Subtropical Old World	Native	Ui	AP, MN, NL
27	<i>Ephedra intermedia</i> Schrenk & C.A.Mey.		Ephedraceae	GN	Conifer	Shrub			New	Ui	AP
28	<i>Euphorbia hirta</i> L.	Asthma weed	Euphorbiaceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP, MN
29	<i>Fagopyrum esculentum</i> Moench	Buckwheat	Polygonaceae	AN	Dicot	Herb	Annual	Asia	New	Ui	NL
30	<i>Galinsoga parviflora</i> Cav.	Gallant soldier/ Quickweed	Asteraceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP, MN
31	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	Bugweed	Asteraceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP, NL
32	<i>Girardinia diversifolia</i> (Link) Friis	Himalayan nettle	Urticaceae	AN	Dicot	Shrub	Annual/Perennial	Tropical & Subtropical Old World	New	Ui	AP, NL
33	<i>Gnaphalium affine</i> D. Don	Jersey cudweed/ Cotton Weed	Asteraceae	AN	Dicot	Herb	Annual	Tropical America	Established	Ui	AP, NL
34	<i>Hyptis suaveolens</i> (L.) Poit.	Pignut	Lamiaceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP, MN
35	<i>Imperata cylindrica</i> (L.) Raeusch.	Cogon grass	Poaceae	AN	Monocot	Grass	Perennial	Tropical America	Established	Ui	AP, MN, NL
36	<i>Ipomoea carnea</i> Jacq.	Pink morning glory	Convolvulaceae	AN	Dicot	Shrub	Perennial	Tropical America	New	Ui	MN
37	<i>Lantana camara</i> L.	Lantana/ Big sage	Verbenaceae	AN	Dicot	Shrub	Perennial	Tropical America	Established	O	AP, MN, NL

38	<i>Laportea interrupta</i> (L.) Chew	Hen's Nettle	Urticaceae	AN	Dicot	Herb	Annual	Asia/ Australia	New	Ui	AP, NL
39	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	Bushy Lippia	Verbenaceae	AN	Dicot	Shrub	Perennial	South America	New	Ui	AP
40	<i>Melastoma malabathricum</i> L.	Malabar Melastome	Melastomaceae	AN	Dicot	Shrub	Perennial	Asia/ Australia	New	Ui	AP, MN
41	<i>Mikania micrantha</i> Kunth	Bitter vine/ Mile-a-minute	Asteraceae	AN	Dicot	Climber	Perennial	South America	Established	I	AP, MN, NL
42	<i>Mimosa invisa</i> Colla	Giant sensitive plant	Fabaceae	AN	Dicot	Shrub	Perennial	South America	Established	Ui	MN
43	<i>Mimosa pudica</i> L.	Touch-me-not/ Shameplant	Fabaceae	AN	Dicot	Herb	Perennial	Central America South America	Established	Ui	AP, MN, NL
44	<i>Mitracarpus hirtus</i> (L.) DC.	Tropical girdle	Rubiaceae	AN	Dicot	Herb	Annual	South America		Ui	AP
45	<i>Mucuna</i> sp.		Fabaceae	AN	Dicot	Climber	Perennial		New	Ld	MN
46	<i>Osbeckia nepalensis</i> Hook. f.	Nepal Pink Osbeckia	Melastomaceae	AN	Dicot	Shrub	Perennial	Asia	New	Ui	AP, MN, NL
47	<i>Parthenium hysterophorus</i> L.	Congress grass	Asteraceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP, MN, NL
48	<i>Peperomia pellucida</i> (L.) Kunt	Silverbush	Piperaceae	AN	Dicot	Herb	Annual	South America	New	Ui	AP, MN
49	<i>Persicaria perfoliata</i> (L.) H.Gross	Asiatic tearthumb	Polygonaceae	AN	Dicot	Herb	Annual	Asia	New	Ui	AP
50	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Tall Reed	Poaceae	AN	Monocot	Grass	Perennial	North America	New	Ui	AP, MN, NL
51	<i>Phaulopsis dorsiflora</i> (Retzius)		Acanthaceae	AN	Dicot	Herb		Africa	New	Ui	AP

52	<i>Pilea scripta</i> (Buch.-Ham. ex D. Don) Wedd.	Himalayan Clearweed	Urticaceae	AN	Dicot	Herb	Perennial	Asia	New	Ui	AP, MN, NL
53	<i>Plantago major</i> L.	Broadleaf plantain	Plantaginaceae	AN	Monocot	Herb	Perennial	Africa	Naturalised	Ui	AP, MN, NL
54	<i>Pueraria</i> sp.	Kudzu/ Japanese arrowroot	Fabaceae	AN	Dicot	Climber	Perennial	Tropical America	New	Ui	AP, MN
55	<i>Richardia scabra</i> L.	Rough Mexican clover	Rubiaceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP
56	<i>Rubus ellipticus</i> Sm.	Himalayan raspberry	Rosaceae	AN	Dicot	Shrub	Perennial	Asia	New	Ui	AP, MN, NL
57	<i>Rubus</i> sp.		Rosaceae	AN	Dicot	Shrub	Perennial		New	Ui	NL
58	<i>Rumex nepalensis</i>	Nepal Dock	Polygonaceae	AN	Dicot	Herb		Asia	New	Ui	AP
59	<i>Saccharum spontaneum</i> L.	Kans grass	Poaceae	AN	Monocot	Grass	Perennial	Asia	Established	Ui	AP
60	<i>Scoparia dulcis</i> L.	Sweet broom	Plantaginaceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP
61	<i>Sigesbeckia orientalis</i> L.		Asteraceae	AN	Dicot	Herb	Annual	Africa, Asia		Ui	AP, MN
62	<i>Solanum viarum</i> Dunal	Tropical soda apple	Solanaceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP, MN, NL
63	<i>Solanum torvum</i> Sw.		Solanaceae	AN	Dicot	Shrub	Perennial	South America	New	Fd	MN
64	<i>Spermacoce alata</i> Aubl.	Winged false buttonweed	Rubiaceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP, MN
65	<i>Spermacoce exilis</i> (L.O. Williams) C.D.Adams ex W.C.Burger & C.M.Taylor		Rubiaceae	AN	Dicot	Herb	Perennial	South America	New	Ui	AP
66	<i>Stachytarpheta indica</i> (L.) Vahl	Blue snakeweed	Verbenaceae	AN	Dicot	Herb	Annual	Tropical America	New	Ui	AP, MN

67	<i>Synedrella nodiflora</i> (L.) Gaertn.	Nodeweed	Asteraceae	AN	Dicot	Herb	Annual	Africa	New	Ui	AP, MN
68	<i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda	Broom Grass	Poaceae	AN	Monocot	Grass	Perennial	Asia	Native	Pl	AP, MN, NL
69	<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	Tree marigold	Asteraceae	AN	Dicot	Shrub	Perennial	South America	New	O	AP, MN, NL
70	<i>Triumfetta pilosa</i> Roth		Malvaceae	AN	Dicot	Shrub	Perennial	Tropical Africa	New	Ui	MN, NL
71	<i>Triumfetta rhomboidea</i> Jacq	Diamond burbark	Tiliaceae	AN	Dicot	Shrub	Perennial	Tropical America	New	Ui	AP, MN, NL
72	<i>Urena lobata</i> L.	Caesarweed	Malvaceae	AN	Dicot	Shrub	Perennial	Tropical America	Established	Ui	AP, MN, NL
73	<i>Urtica dioica</i> L.	Stinging Nettle	Urticaceae	AN	Dicot	Herb	Perennial	Africa, Europe	New	Ui	AP, NL

Data Analysis

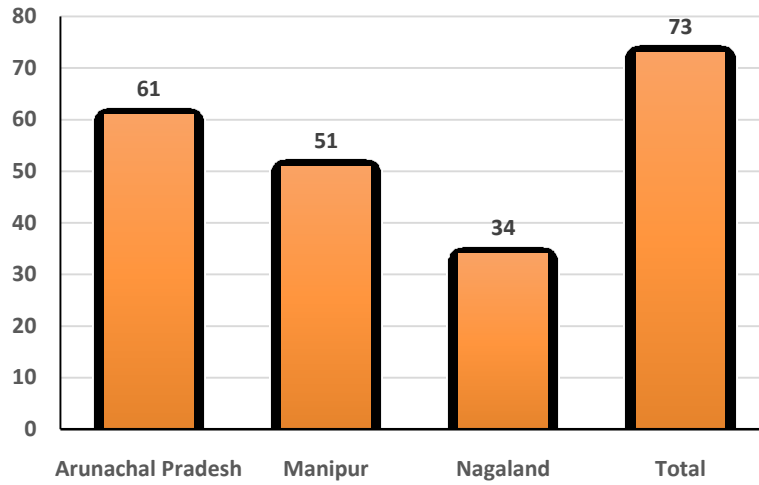


Fig. 4. Number of recorded invasive species from the three Himalayan States

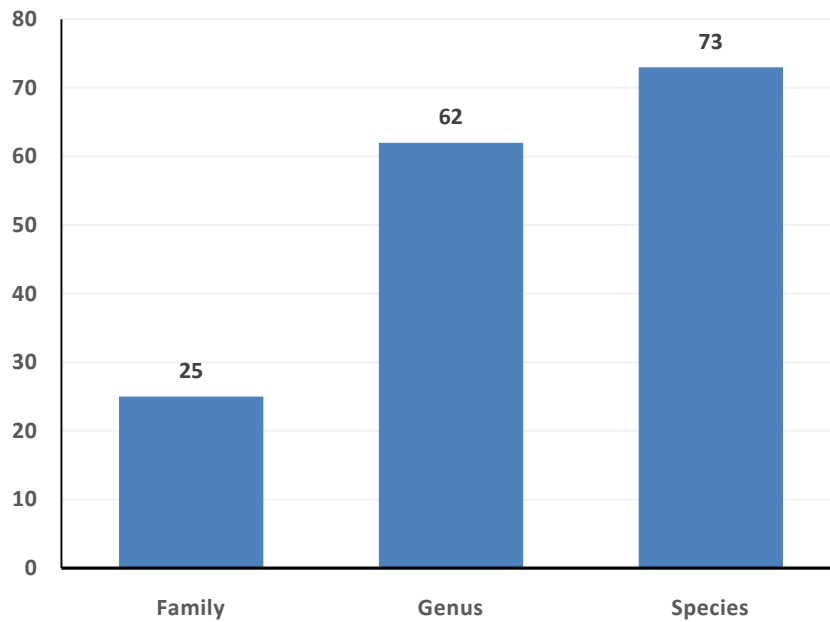


Fig. 5. Number of taxa reported from the three states

Table 4. Number of taxa reported from each of the three Himalayan States

No. of Taxa	Arunachal Pradesh	Manipur	Nagaland
Families	24	21	14
Genera	57	45	31

Species	61	51	34
---------	----	----	----

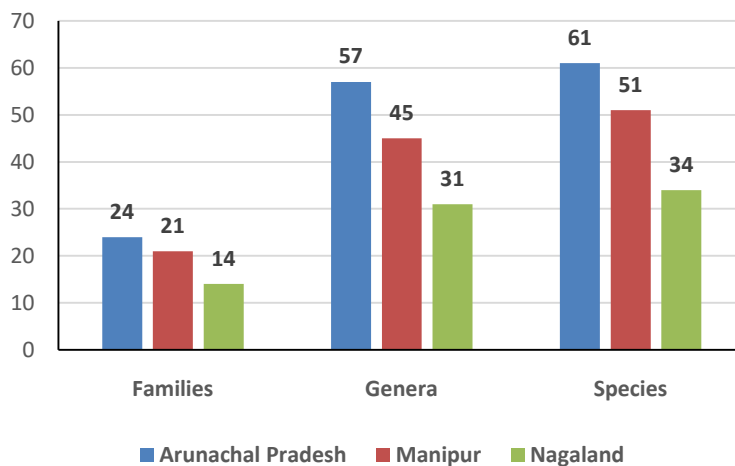


Fig. 6. Number of taxa reported from each of the three Himalayan States

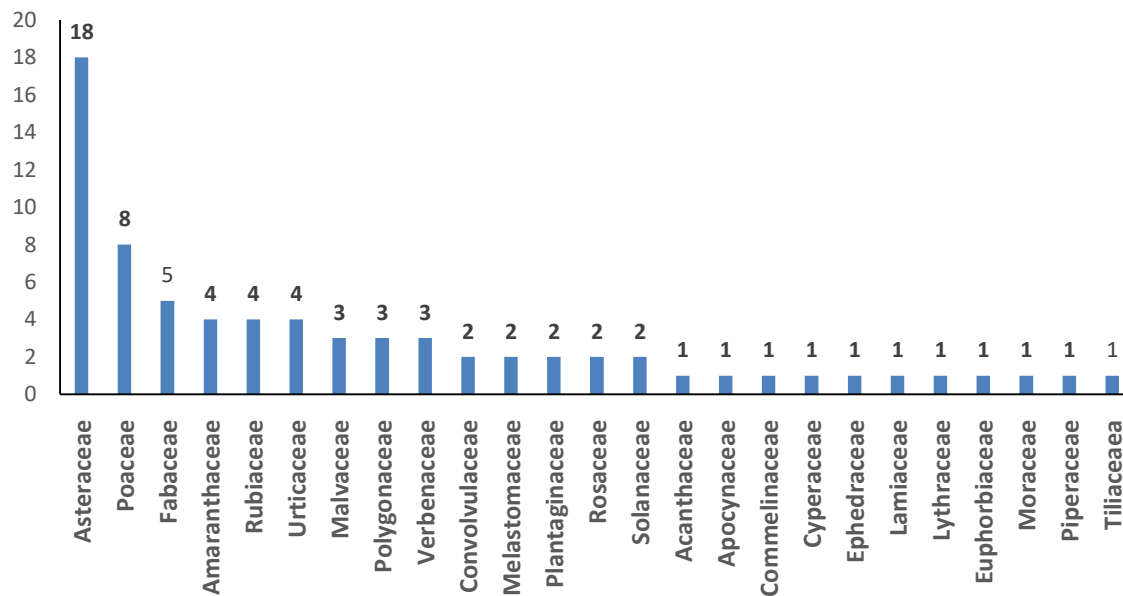


Fig. 7. Observed families for the seventy-three different plants

Table 5. Characterisation of plant species on the basis of growth form

Growth form	Arunachal Pradesh	Manipur	Nagaland	Total
Herbs	45	34	20	50
Shrubs	12	13	11	17
Trees	1	1	2	2
Climbers	3	3	1	4

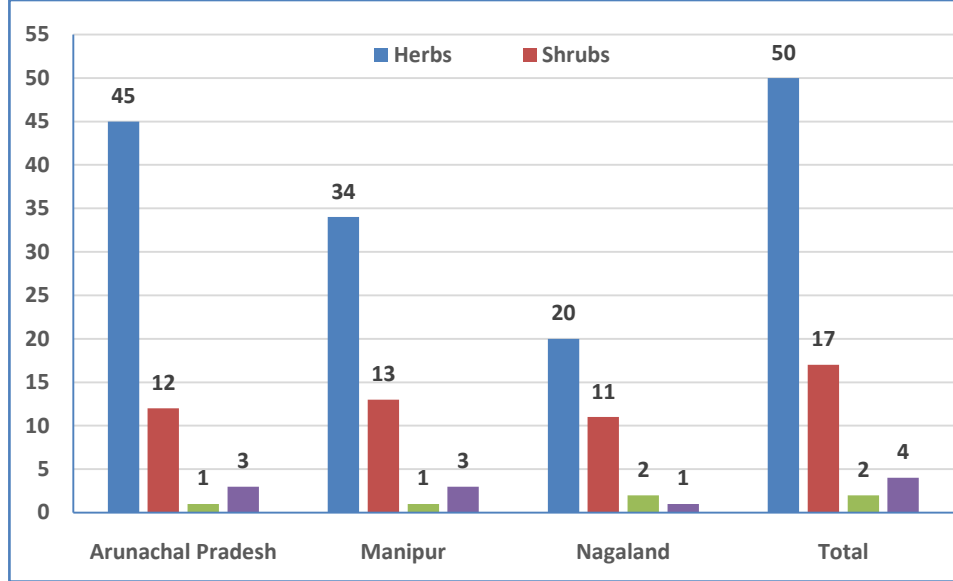


Fig. 8. Characterisation of plant species on the basis of life forms

Table 6. The invasive status of ten different invasive species according to their respective average frequency, density and dominance values in the states.

Sl. No.	Species	Family	Taxonomic Group	Taxonomic sub-group	Average		
					%Frequency	Density	Cover/Dominance
1	<i>Ageratina adenophora</i>	Asteraceae	Angiosperm	Dicot	60.83	69.55	44.80
2	<i>Ageratum conyzoides</i>	Asteraceae	Angiosperm	Dicot	52.50	19.55	0.99
3	<i>Ageratum houstonianum</i>	Asteraceae	Angiosperm	Dicot	72.08	23.68	1.96
4	<i>Bidens pilosa</i>	Asteraceae	Angiosperm	Dicot	38.33	4.77	0.38
5	<i>Chromolaena odorata</i>	Asteraceae	Angiosperm	Dicot	77.50	32.05	26.67
6	<i>Galinsoga quadriradiata</i>	Asteraceae	Angiosperm	Dicot	-	-	-
7	<i>Lantana camara</i>	Verbenaceae	Angiosperm	Dicot	76.67	9.51	36.34
8	<i>Mikania micrantha</i>	Asteraceae	Angiosperm	Dicot	78.33	17.71	0.75
9	<i>Tithonia diversifolia</i>	Asteraceae	Angiosperm	Dicot	50.00	50.83	150.32
10	<i>Parthenium hysterophorus</i>	Asteraceae	Angiosperm	Dicot	-	-	-

Table 7. Summary of the status of IAVPS observed at different sites and elevations in Manipur

Locality	Elevation Range (amsl)	Species	%Frequency	Density	IVI
ChhotoBegra, Jiribam (33m amsl)	<300m	<i>Ageratum houstonianum</i>	62.5	28.37	70.67
		<i>Alternanthera philoxeroides</i>	12.5	1.12	4.89
		<i>Chromolaena odorata</i>	83.33	53.33	98
		<i>Lantana camara</i>	50	6.5	59.88
		<i>Mikania micrantha</i>	83.33	32.83	48.07
		<i>Mimosa pudica</i>	25	0.875	5.12
Kwatha Khunou, Tengnoupal (218m amsl)	<300m	<i>Ageratum conyzoides</i>	100	29.6	129.25
		<i>Chromolaena odorata</i>	40	12.2	122.21
		<i>Mikania micrantha</i>	80	14.8	71.22
		<i>Crassocephalum crepidiodes</i>	50	7.5	53.53
Kwatha, Tengnoupal, (338m amsl)	300-600m	<i>Ageratum conyzoides</i>	60	9.1	56.23
		<i>Ageratum houstonianum</i>	50	6.7	46.64
		<i>Chromolaena odorata</i>	100	45	148.86
		<i>Mikania micrantha</i>	100	23.6	50.12
		<i>Bidens pilosa</i>	30	4.2	24.29
Lamdeng, Imphal West (811m amsl)	600-900m	<i>Ageratina adenophora</i>	100	158.60	128.74
		<i>Bidens pilosa</i>	25	2.8	12.18
		<i>Chromolaena odorata</i>	100	34.20	34.81
		<i>Lantana camara</i>	100	12.60	33.03
		<i>Mikania micrantha</i>	80	18	15.82
Nongmaiching, Imphal East (1120m amsl)	900-1200m	<i>Ageratum conyzoides</i>	37.5	63.87	40.44
		<i>Bidens pilosa</i>	37.5	12.25	17
		<i>Chromolaena odorata</i>	100	35.33	33.29
		<i>Imperata cylindrica</i>	87.5	73.12	83.18
		<i>Mikania micrantha</i>	33.33	6.17	7.96
		<i>Tithonia diversifolia</i>	50	50.83	101.31
Laimaton, Senapati (1432m amsl)	1200-1500m	<i>Ageratina adenophora</i>	83.33	102	72.39
		<i>Ageratum houstonianum</i>	90	51.3	77.01
		<i>Bidens pilosa</i>	50	4.4	10.94
		<i>Chromolaena odorata</i>	33.33	4.67	6.89
		<i>Lantana camara</i>	83.33	11.33	38.47
		<i>Mikania micrantha</i>	40	1.8	6.68
		<i>Imperata cylindrica</i>	20	4.6	9.11
Lairouching, Senapati (1270m)	1200-1500m	<i>Ageratina adenophora</i>	40	16.4	159.05
		<i>Ageratina riparia</i>	100	25.4	188.94
		<i>Ageratum conyzoides</i>	40	4.6	25.77
		<i>Bidens pilosa</i>	40	4	24.12

The study shows the current status of the different invasive plants in different localities under different climatic zones in Manipur. New observations of IAVPS include *Ageratina riparia* and *Alternanthera philoxeroides*. Vast expanse of undershrub *A. riparia* was observed coexisting with *A. adenophora* at Lairouching while an isolated population of *A. philoxeroides* was reported from Chhotobegra. *Chromolaena odorata* and *Mikania micrantha* were observed to be widely distributed in all the localities surveyed as per the DEMs of 300m asl elevations except in Lairouching and their population density as well as frequency of occurrence were lower than that of high altitudes. IVI values of *Chromolaena odorata* decreased with an increase in the elevation. IVI value 98.00 was observed at <300m asl plot and it was lowest at 1200-1500m asl (6.89 IVI).

Tithonia diversifolia was observed only at Nongmaiching (900-1200m asl) having population density of 50.83 individuals per 25 square metre and IVI value 101.31. In addition, dense population of *Imperata cylindrica* (IVI 83.18) was also recorded at this elevation. The widespread expansion of *Mucuna bracteata* Kwatha was a serious problem there since most of the nearby hillsides were covered by the said plant due to its rapid growth. It was observed that these plants caused problems in the agricultural plots and the crops.

Ageratum houstonianum was also found dominating among the herbaceous vegetations at <300m asl, 300-600m asl and 1200-1500m asl while higher density, frequency and IVI was recorded at Laimaton (1200-1500m asl). *Ageratum conyzoides* was observed to be dominant at Kwatha Khunou with *Crassocephalum crepidioides* and at Nongmaiching (900-1200m asl) with frequency of 37.5%, density 63.87 per square metre and lastly, IVI value 40.44. Thick populations of *Ageratina adenophora* having the density of 158.60 per 25 square metre and IVI 128.74 were also recorded in the plantation forests of Lamdeng (600-900m asl) along with other IAVPS like *Bidens pilosa*, *Chromolaena odorata*, *Lantana camara* and *Mikania micrantha*. *Ageratina adenophora* was also observed at 1200-1500m asl with lower population density 102 individuals and IVI value of 72.39. *Lantana camara* was present in three locations and the larger size old *Lantana* plants were recorded at Laimaton (1200-1500m asl) having frequency 83.33% and 38.47 IVI. Apart from these, a potentially invasive plant *Artemisia* sp. was observed with a frequency of 83.33% at high elevations with densities ranging from 76.17-108.33 per 25 square metre.

1. Arunachal Pradesh:

Summary of the observed IAVPS in the three localities

Two localities in West Kameng district of Arunachal Pradesh were surveyed and the sampling was done at two different plots, Bhalukpong (199m asl) and Nechiphu (1699m asl) both of which represent <300m asl and 1500-1800m asl plot samples respectively. Another field study was conducted at Old Sagalee road, Papum Pare district.

Table 8. Summary of the status of alien invasive plants observed at West Kameng District in Arunachal Pradesh

Locality	Elevation Range (asl)	Species	%Frequency	Density	IVI
Bhalukpong,	<300m	<i>Ageratum conyzoides</i>	70	19.6	57.18

West Kameng (199m asl)		<i>Ageratum houstonianum</i>	70	15	48.62
		<i>Bidens pilosa</i>	20	1	5.47
		<i>Chromolaena odorata</i>	83.33	45.83	109.29
		<i>Lantana camara</i>	50	4.50	30.50
		<i>Mikania micrantha</i>	66.67	11	23.08
		<i>Mimosa pudica</i>	10	0.67	2.62
Nechiphu, West Kameng (1699m asl)	1500-1800m	<i>Ageratina adenophora</i>	20	1.8	14.55
		<i>Ageratum conyzoides</i>	30	2.3	3.96
		<i>Ageratum houstonianum</i>	80	23.3	27.25
		<i>Bidens pilosa</i>	50	12.60	33.03
		<i>Plantago major</i>	80	8.9	35.21
Old Sagalee rd. Papum Pare (551m asl)	600-900m	<i>Ageratum conyzoides</i>	40	7.8	41.98
		<i>Ageratum houstonianum</i>	80	17.4	96.73
		<i>Bidens pilosa</i>	80	9	61.70
		<i>Chromolaena odorata</i>	80	25.8	119.83
		<i>Lantana camara</i>	100	12.6	94.46
		<i>Mikania micrantha</i>	100	11.6	48.51

In the experimental plot of <300m asl elevation, *Chromolaena odorata* already established with 83.33% frequency and density of 45.83 individuals per 25 square metre with IVI 109.29. *Lantana camara* (IVI=30.50) and *Mikania micrantha* (IVI=23.08) were also observed with lower populations while *L. camara* was having a lesser density of 4.50 than that of *M. micrantha* (11). For herbaceous vegetation, both *Ageratum conyzoides* and *Ageratum houstonianum* were frequently observed having IVI values of 57.18 and 48.69 respectively. Other plants like *Bidens pilosa*, *Cynodon dactylon*, *Mimosa pudica* and *Synedrella nodiflora* were also recorded with respective IVI values of 5.47, 11.05, 2.62 and 12.90 respectively while for other shrubs, *Sida acuta* (6.67), *Triumfetta rhomboidea* (44.68) and *Urena lobata* (13.61) were also observed to be dominating.

Dense population of *C. odorata* and *L. camara* were recorded from 600-900m asl at Old Sagalee. *Mikania micrantha* (IVI=48.51) population was also found to be covering dominantly over other species. *L. camara* and *M. micrantha* were the most frequent species here. Among the herbaceous vegetation, *A. houstonianum* was dominant over *A. conyzoides* and *Bidens pilosa*.

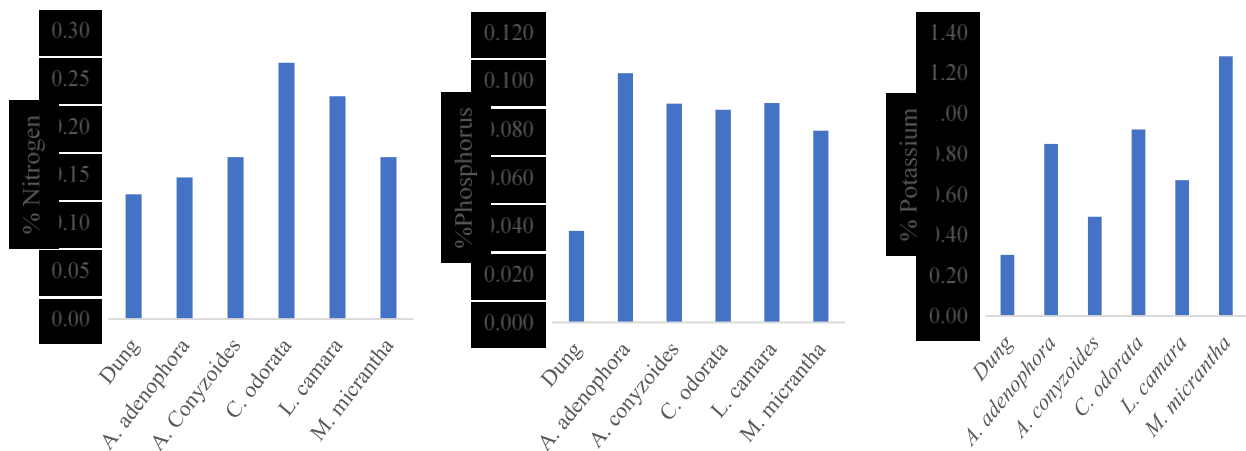
An isolated population of, *Ageratina adenophora* (IVI=14.55) was observed with growing density of 1.8 individuals per 25 square metre at Nechiphu (1500-1800m asl). Other important invasive plants like *Chromolaena odorata*, *Lantana camara* and *Mikania micrantha* were not observed in this high elevation permanent plot. However, both the two species of *Ageratum* namely, *A. houstonianum* and *A. conyzoides* were recorded there but, *A. houstonianum* was dominant than *A. conyzoides* in terms of both frequency and population density. *Bidens pilosa* (IVI 6.74) was also found commonly on the study site with population density of 4.8 individuals per metre square and 50 percent frequency.

Vermicomposting Experiment

- **Sample collection:** Fruits and vegetables crates used as compost bins, plastic mulching required for vermicomposting were purchased from the market of Nirjuli, Arunachal Pradesh. Cow dung was collected from the government dairy farm, Nirjuli. Epigeic earthworms (*Eisenia fetida*) were purchased from CSIR-NEIST, Itanagar. *Ageratum*

conyzoides, *Chromolaena odorata*, *Lantana camara*, *Mikania micrantha* were collected from the roadside of the NERIST compound and *Ageratina adenophora* was collected from West Kameng district of Arunachal Pradesh.

- **Vermicompost Reactor:** Five numbers of reactors bins were marked with selected IAVPS. Vermicompost reactors are cuboidal crates with length 0.42m, width 0.32m and height 0.28 m. The inner surface is embedded with mulching plastic to block the escape of earthworms through small holes. The top of the reactor is kept open to supply feed material, water, bedding materials and for the sample collection of the product periodically.
- **Feeding Materials:** Selected IAVPS (leaves and stem) were chopped into small pieces and slightly grinded and partially dried and later mixed with cow dung to homogeneity. 1 L of water was sprinkled in each reactor bins. The mixture was then allowed to stand for 5 days before earthworms were introduced.
- **Vermicomposting process:** After five days, 75 adult earthworms were inoculated into each reactor bins. Water was sprinkled every day to maintain 80% moisture content of the feed materials. The key parameters – moisture content, pH, Nitrogen, Phosphorus and Potassium are analyzed periodically. The composting was carried out for 4 months using cow dung containing 0.13 % total nitrogen, 0.038% total phosphorus and 0.30% total potassium. The pH of the dung was 6.72.
- **Harvesting of Vermicompost:** The digested end product of the composting material was harvested, partially air dried and nutrient contents of the dried vermicompost were analyzed adopting the following methods.
 1. pH Standard pH Method (Bio-Era pH Meter)
 2. Total Nitrogen Kjeldahl Method
 3. Total Phosphorus Molybdenum Blue Method
 4. Total Potassium Flame Photometric Method



- All the data presented are the average of the triplicate measurements.
 - pH:** The pH of selected five IAVPS composts range between 6.0 – 7.0 unit. *Ageratum conyzoides* compost was observed being the most acidic with pH 6.11.
 - Total Nitrogen:** The total nitrogen content was found highest in *Chromolaena odorata*, 0.27 % and lowest in *Ageratina adenophora*, 0.15%.
 - Total Phosphorus:** The total phosphorus content was found highest in *Ageratina adenophora*, 0.10% and lowest in *Mikania micrantha*, 0.079 %.
 - Total Potassium:** The total potassium content was found highest in *Mikania micrantha*, 1.28% and lowest in *Ageratum conyzoides*, 0.49 %.
- Cost Management:** The total cost was calculated for each 10 Kg of IAVPS compost yield as per the experimental set up done in the laboratory.

Table 1: Total expenditure for each laboratory compost bin set ups

Sl. No.	Raw Materials	Cost (Rs.)
1	Fruit Bins	100.0
2	Mulching Plastic (Waste plastic materials were used)	0.0
3	Cow Dung	0.0
4	Earth Worms (Rs. 2 per earthworm)	140.0
5	Plant Materials	0.0
6	Labor charges & miscellaneous expenditure	50.0
	Total	290.0

- For the production of 10 Kg of compost, the minimal cost for the raw materials was very less as all raw materials were profusely and freely available. The present market value for 1 Kg organic compost is Rs. 80 ± 10. For 100 Kg of compost the total expenditure is 35-40% of the market value. A family in north-east India have a potential to earn 60-65 % of the total expenditure for 100 Kg IAVPS compost production every 4 months in a year. This will generate approximately Rs. 20,000 income per year traditionally with very less expenditure and manpower. Composting of invasive species will also cut 60-70 % cost of the fertilizer used in organic farming.
- The study suggests the production of large quantity of organic compost from invasive species will be affordable and will reduce the cost for subsistence farming in Arunachal Pradesh, Manipur and Nagaland. The practical composting of invasive species for local farming will also significantly control the IAVPS invasion and reduce the population ultimately eradicating the threats posed by invasive species.

Analysis of chlorophyll (a, b and total)

- Amount of chlorophyll contents (chlorophyll a, b and total chlorophyll) were analyzed for *A.conyzoides*, *A.houstonianum*, *C. odorata*, *L. camara*, and *M. micrantha* by centrifugal extraction and photometric estimation following the standard methods of Arnon (1949).
- C. odorata* showed higher values of Chlorophyll a (1.88 mg/g tissue), Chlorophyll b (0.75 mg/g tissue) and total Chlorophyll (2.63 mg/g tissue) while *A. conyzoides* was found to have the lowest

content of Chlorophyll a, b, and total i.e. 1.13 mg/g tissue, 0.44 mg/g tissue and 1.57 mg/g tissue respectively.

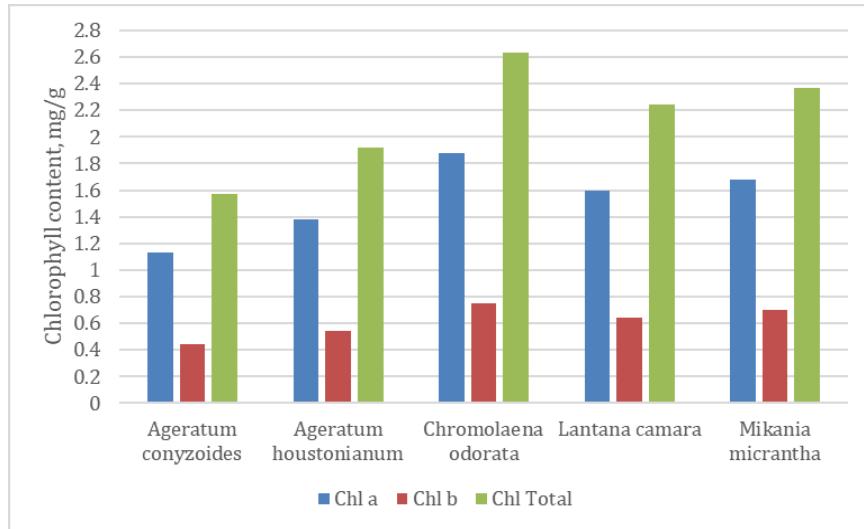


Fig. 2. Chlorophyll contents of the five IAVPS

Germination Experiment

Seed germination experiments of the selected IAVPS, *Ageratum conyzoides*, *Ageratum houstonianum*, *Mikania micrantha* and *Lantana camara* were conducted considering the following parameters: Germination percent, germination energy and germination period. 50 seeds with 5 replicates of each species were introduced on wetted blotting papers inside the petriplates and the germination of seeds was recorded daily for each of the species maintaining the optimal moisture and temperature in the petriplates. Most of the seeds of *A. conyzoides*, *A. houstonianum* *M. micrantha* were germinated while none of the seeds of *L. camara* did not germinate. All of them attained peak germination periods within a week, provided suitable conditions for seed germination. Out of the following three species, *M. micrantha* exhibited the successful amount of germination percent, germination energy and the earliest germination period or peak germination than the rest of others (Table below).

Table 2. Seed biology parameters of the seeds collected from study sites (in mean±SD)

Sl. No.	Species	Seeds Geminated (Mean±SD)	Seeds Sown	Germination Percent (Mean±SD)	Germination Energy (Mean±SD)	Germination Period (in days) (Mean±SD)
1	<i>Ageratum conyzoides</i>	43.6 ±3.05	50	87.2 ±6.10	59.5 ±8.70	5.8 ±0.45
2	<i>Ageratum houstonianum</i>	38 ±1.58	50	76 ±3.16	55.6 ±5.54	6.4 ±0.54
3	<i>Mikania micrantha</i>	44 ±1.22	50	88 ±2.45	61.2 ±8.2	4.8 ±0.55

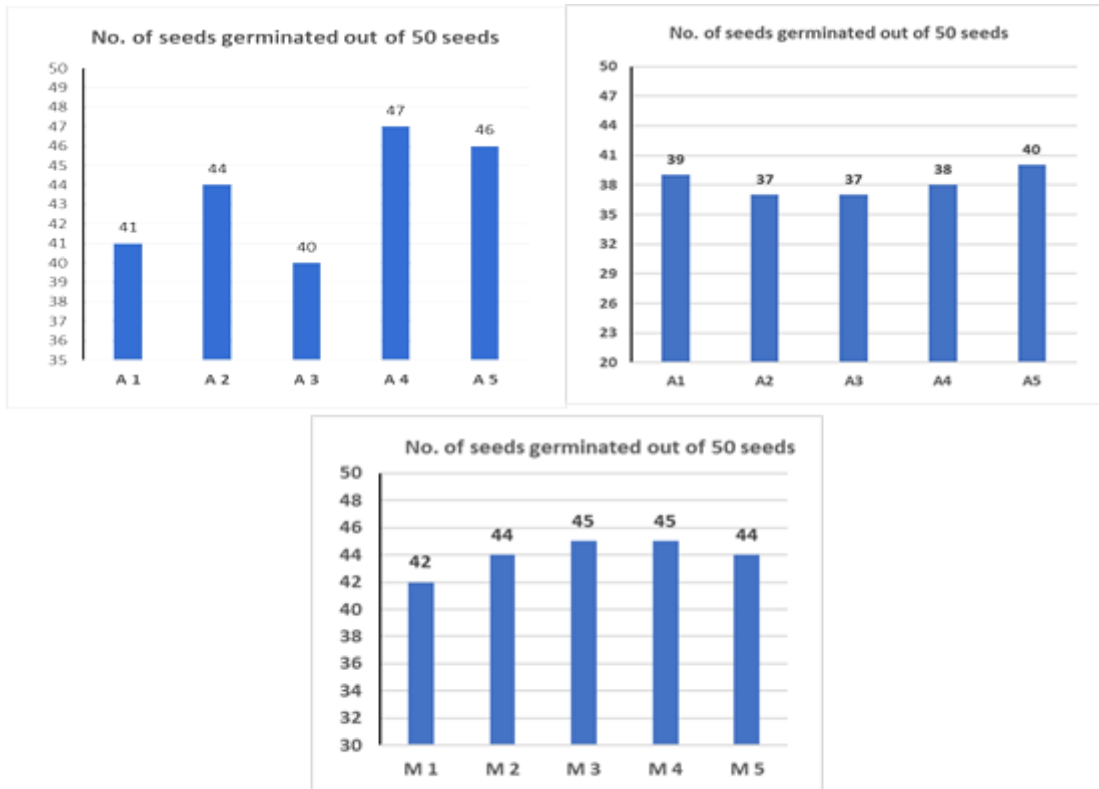
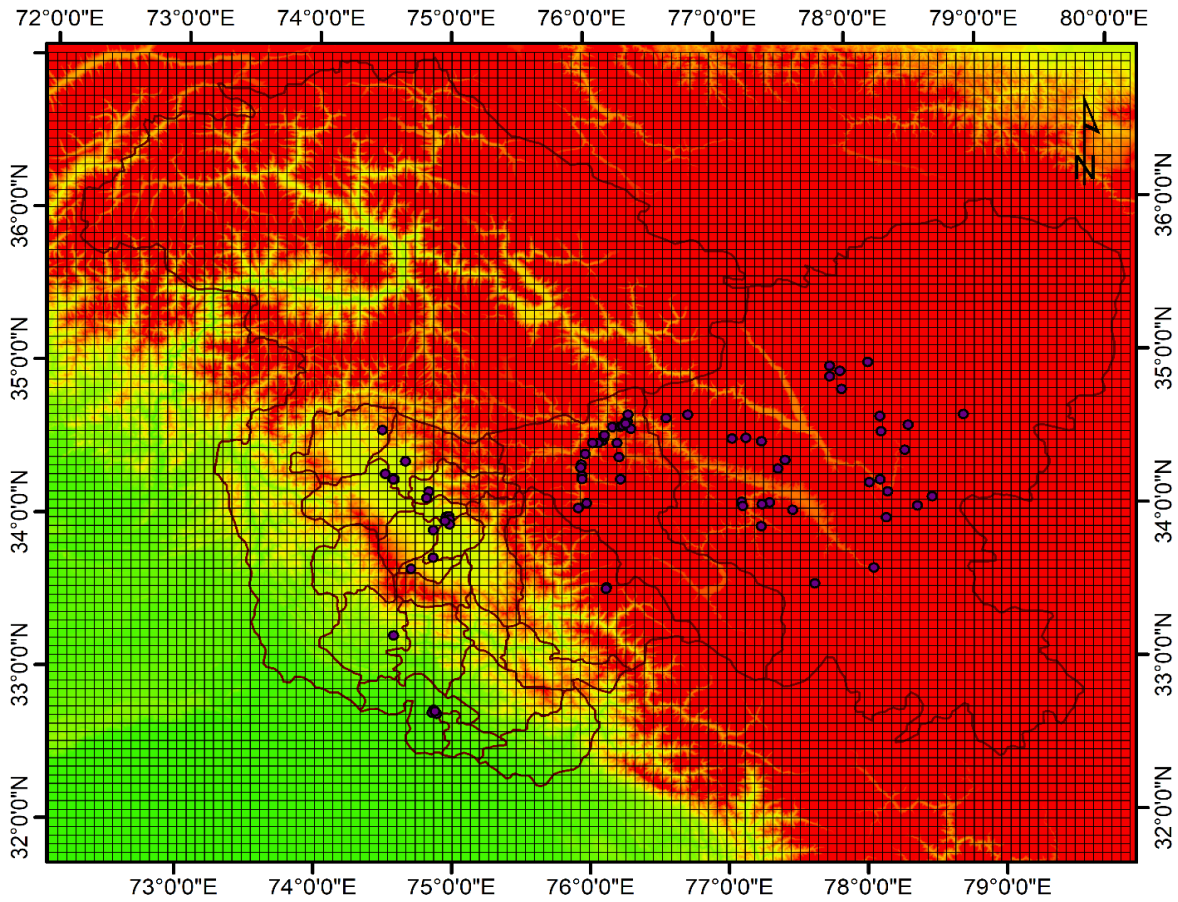


Fig. 3. Total number of seeds germinated in each of the five replicates of *Ageratum conyzoides*, *Ageratum houstonianum* and *Mikania micrantha*.

**SITE DETAILS AND MAPS
(Jammu & Kashmir, Ladakh)**



Legend

- Sample Sites
- Grid (6.25 x 6.25 km)

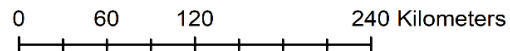


Fig.1. Map showing the grids and study sites.

Geo-coordinates of the surveyed/selected sites

Ladakh Collection sites				
Site Name	Altitude (m asl)	Latitude	Longitude	Habitat Type
Titichumik	2752	33°32'0.8.0"N	76°08'18.4"E	Sandy and Rocky
Minji	2751	33°31'28.4"N	76°08'05.2"E	Moist and shady area

Trespone	2781	34°30'21.7"N	76°07'36.4"E	Rocky open area
Kargil campus	2829	34°29'35.8"N	76°07'13.2"E	Rocky area
Faroona	2797	34°29'53.8"N	76°71'12.6"E	Rocky area
Lankarchay	2735	34°31'04.7"N	76°07'49.6"E	Moist and shady Area
Sankoo	2832	34°28'44.3"N	76°05'17.6"E	Moist and shady Area
Karpokhar	2825	34°28'44.3"N	76°02' 52.2"E	Rocky open type
Damahssna	3115	34°24'2983"N	75°59'30.9"E	Rocky open area
Suroo	2731	34°31'46.9"N	76°08'14.7"E	Along road side shady and Moist
Hunderman	2904	34°20'20.3.0"N	75°57'.49.5" E	Rocky Area
Panikhar	2946	34°19'08.3.0"N	75°57'27.0"E	Moist Area
Barsoo	3010	34°15'55.9"N	75°58'00.1"E	Shady Moist Area
Nunkun glacier	3391	34°14' 40.6"N	75°58'02.0"E	Open Rocky area
Parkhachik	3359	34°03' 17.8"N	75°56'16.1"E	Rocky Moist area
Zanskar	3628	34°05' 11.4"N	75°59'56.1"E	Open and Rocky sandy area
Rangdum	3126	34°36' 57.6"N	76°17'47.5"E	Open Rocky Area
Pashkum	3822	34°34' 54.9"N	76°11'47.5"E	Shady and Moist
Wakha	3407	34°37' 08.7"N	76°18'30.5"E	Shady area
Shargole	2880	34°39' 43.3"N	76°18'51.5"E	Open area Rocky
Batlik	3848	34°35' 03.3"N	76°15'16.7"E	Open area Rocky
Chulichangi	3952	34°35' 37.0"N	76°18'05.5"E	Open Rocky and sandy area
Humbutula top	4372	34°35' 29.0"N	76°16'22.9"E	Open Rocky and sandy area
Garkun	4211	34°34' 11.3"N	76°20'00.8"E	Open Rocky and sandy area
Sheshithang	2967	34°28' 37.7"N	76°13'47.6"E	Open Rocky and sandy area
Sapila	3691	34°23' 06.7"N	76°14'29.7"E	terrestrial area

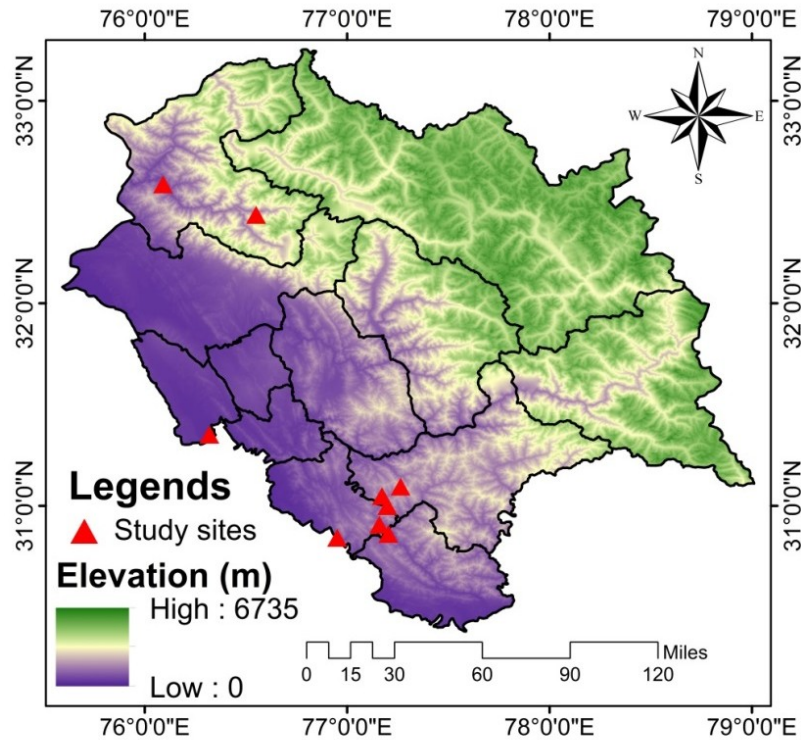
Mulbek	3242	34°38' 12"N	76°35'46.5"E	Agricultural field
Namkeela	3885	34°38'84.3"N	76°45'31"E	open sloppy sandy
Kanji	3852	34°29' 46"N	76°65'01"E	River coast
Lamayaru	3388	34°28' 24"N	76°78'06"E	Agricultural field
Shailanda masjid sheriff	3237	34°06' 90"N	77°73'29"E	Waste land
Hemisgumpa	3600	33°91' 11"N	77°70'87"E	Agricultural field
Karu	3500	33°96' 70"N	77°71'11"E	Open rocky
Chulichungi	3239	34°057'90"N	77°66'33"E	Agricultural field
Sungam	3089	34°01' 14'51"N	77°30'70"E	Sandy area along road
Chilling	3162	34°03' 81"N	77°20'66"E	Agricultural field
Bagsoo	3112	34°20' 53"N	77°27'87"E	Wasteland
Upshi	3390	33°82' 98.8"N	77°81'46.5"E	Road side
Kaira	3713	33°57' 24"N	78°12'30"E	Open rocky area
Karunpile	3900	33°32' 8.8"N	77°40'5.7"E	Road side
Khardungla	4086	33°37' 45"N	77°66'16.3"E	Road side
Nubra sand dunes	3070	34°57' 29"N	77°49'27"E	Sand dunes
DuskitNubra	3393	34°55'17"N	77°53'56"E	Double hunk park
Shoyak	3280	34°32'83"N	77°82'94"E	Agricultural department park
Tangisle	3800	34°12'21"N	78°10'20"E	Road side
Lukung	4217	33°96'51"N	78°40'502"E	Banks of River
Tsoltak	4385	34°10'80"N	78°05'32"E	Banks of River
Changla top	5337	34°04'62"N	77°93'05"E	Rocky Coverd with snow
Zingral	4771	34°01'37"N	77°85'90"E	Open Rocky field
Panikar	3300	33°64'51"N	76°67'98"E	Open rocky field
Remala	3633	34°13'88"N	76°15'03"E	Open rocky field

Munda	3619	33°62'71"N	76°69'05"E	Open rocky field
Pudum	3687	33°54'67"E	76°77'07"E	Open rocky field
Kinool	3300	33°63'41"N	76°76'97"E	Open rocky field
Tukthang	3006	34°53' 19"n	77°49'17"E	Road side
Paskun	2800	34°36' 17"N	76°17'43.1"E	Wasteland
Thila village	3212	34°17'34"N	77°24'67"E	Road side
Suru power project	3002	34°47'74"N	77°54'27"E	Road side
Kashmir Collection sites				
Foreshore	1597	34°5'19"	74°30'44"	Road side
Saida Kadal	1579	34°4'1"	74°30'5"	Waste land
Manasbal	1537	34°14'57.38"	74°40'59.89"	Aquatic
SaderkootBala	1586	34°17'50.85"	74°39'19.96"	Waste land
Wular Vintage 1	1546	34°21'48.79"	74°39'35.56"	Waste land
Ancha lake Soura	1568	34°10'0"	74°47'60"	Waste land
Naidkhai	1569	34°14'43.81"	74°34'34.89" "	Roadside
Bathipora	1577	34°14'48.18"	74°34'08.52"	Road side
Ningli	1594	34°16'51.46"	74°30'33.61"	Aquatic
Wular Vintage 2	1546	34°21'48.75"	74°39'35.53"	Roadside
Nadihal	1544	34°07'25.64"	74°49'01.75"	Roadside
Kaloosa	1537	34°07'25.52"	74°49'01.69"	Roadside
Aloosa	1538	34°07'25.49"	74°49'01.64"	Roadside
Hazratbal	1583	34°7'45"	74°50'32"	Wasteland
Rangar Stop	1583	34°3'46"	74°29'15"	Wasteland
Jammu Collection sites				

Jammu	33°08'88.4"N	74°498'05"E	955	Waste land
Channi	33°04'57.6"N	74°54'65.2"E	758	Agricultural field
Slalkotli	33°01'14.4"N	74°52'01.2"E	1008	Road side
Nagrota	33°13'21.1"N	74°34'37.6"E	949	Field
Bahu fort	33°17'47.6"N	74°32'01.3"E	961	Waste land
Bus stand Jammu	33°39'32.1"N	74°42'5.7"E	1215	Wasteland
Narwal	33°54'46.2"N	74°51'58"E	1175	Agricultural field
Samba	34°29'18.3"N	75°88'02.7"E	1091	Riparian
Pangtherti	34°38'16.3"N	75°05'16"E	923	Riparian
Gandinagar	33°31'28.4"N	76°08'05.2"E	940	Waste land

SITE DETAILS AND MAPS
(Himachal Pradesh)

SITES	LATITUDE	LONGITUDE
1	30°49'55.1"	76°57'02.9"
2	31°20'38.9"	76°19'45.7"
3	32°35'15.4"	76°05'24.0"
4	30°54'25.0"	77°09'31.0"
5	30°51'41.0"	77°12'13.0"
6	30°59'55.0"	77°11'55.0"
7	31°05'40.0"	77°15'49.0"
8	31°02'53.0"	77°10'18.0"
9	30°30'27.9"	77°21'47.3"
10	32°26'12.70"	76°32'57.14"

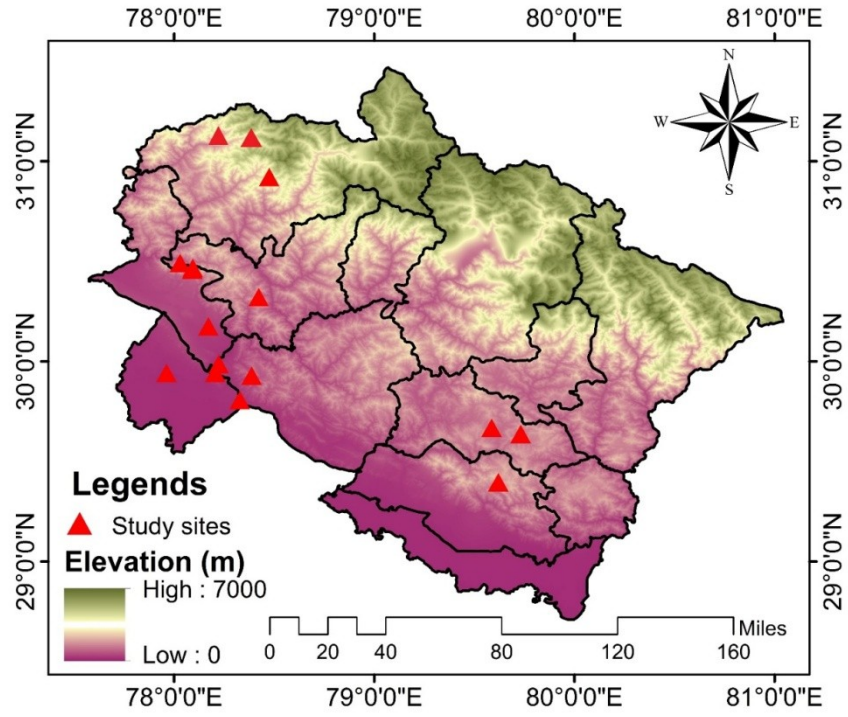


Map of Study Sites

SITE DETAILS AND MAPS
(Uttarakhand & Himachal Pradesh)

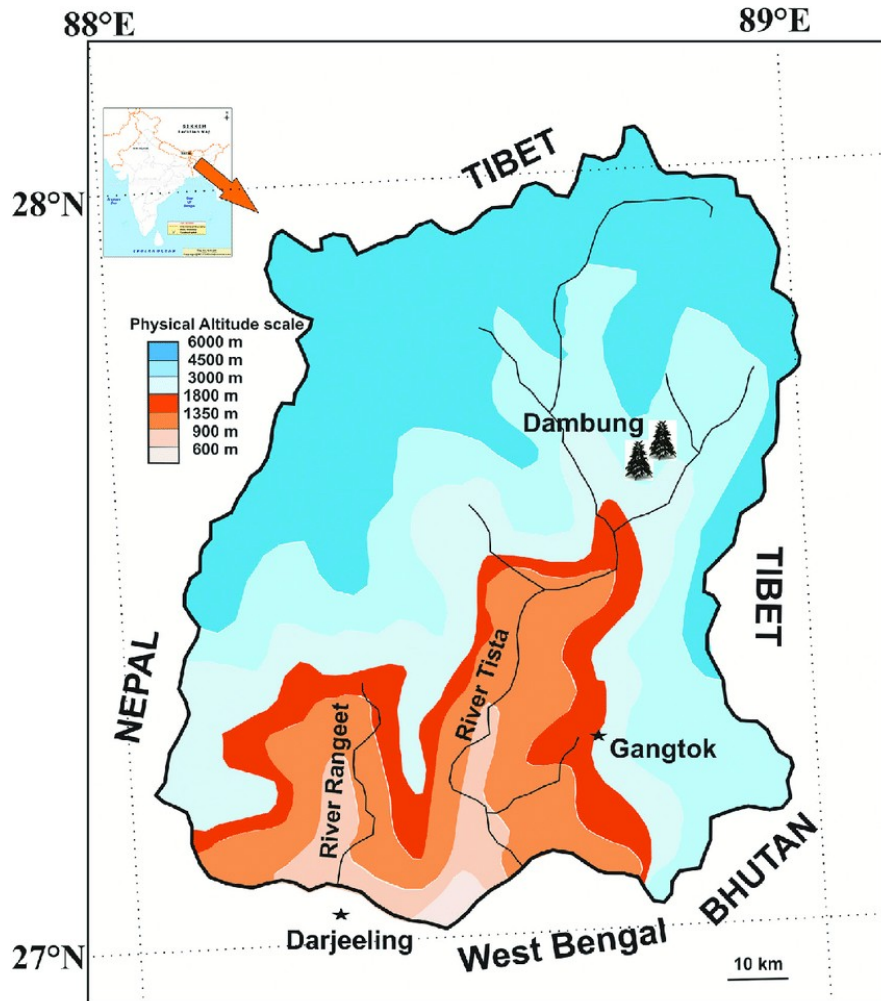
Site 1 to15 belongs to Uttarakhand and Site 16 and 17 belongs to Kinnaur, Himachal Pradesh

Site name	Latitude	Longitude	Altitude(m)
Uttarakhand			
1	30°27'33.721"	078°4'42.978"	1857m
2	31°44'5.881"	076°5'50.161"	1721m
3	30°28'6.780"	078°4'50.221"	1316m
4	30°29'36.060"	078°1'37.679"	1726m
5	29°38'21.059"	079°36'42.779"	1249m
6	29°40'10.859"	079°29'24.000"	1729m
7	29°23'530"	079°30'720"	1649 m
8	29°55'984"	078°09'965"	268m
9	29°48'322"	078°16'32"	301m
10	29°55'486"	078°18'992"	364m
11	29°56'3775"	077° 48'1010"	273m
12	29°59'1745"	078°11'1250"	315m
13	30°55'1960"	078°23'5592"	357m
14	30°19'2062"	078°21'1095"	1027m
15	30°10'3464"	078°08'4241"	445.2m
Kinnaur (Himachal Pradesh)			
16	31°21'5.400"	078°26'16.199"	3520m
17	31°32'10.799"	078°15'31.201"	2477m



Map of Study Sites

SITE DETAILS AND MAPS
(Sikkim & Darjeeling)



Map of study areas

**SITE DETAILS AND MAPS
(Tripura & Mizoram)**

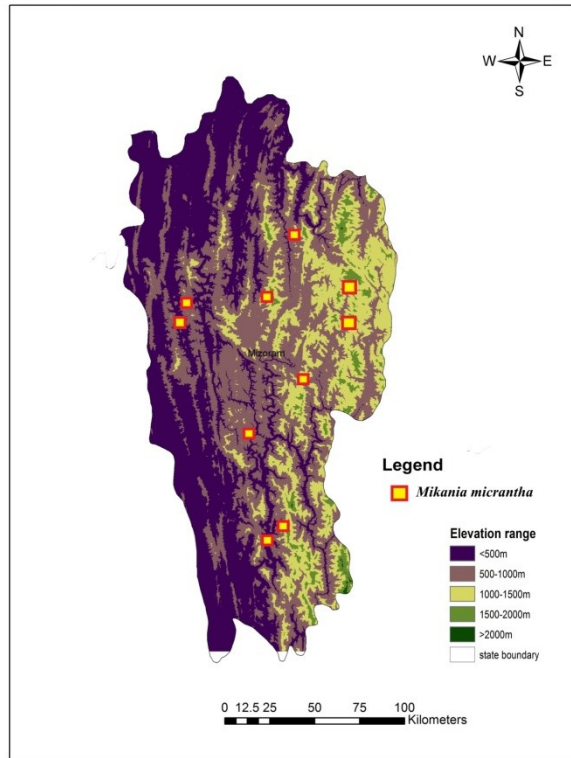
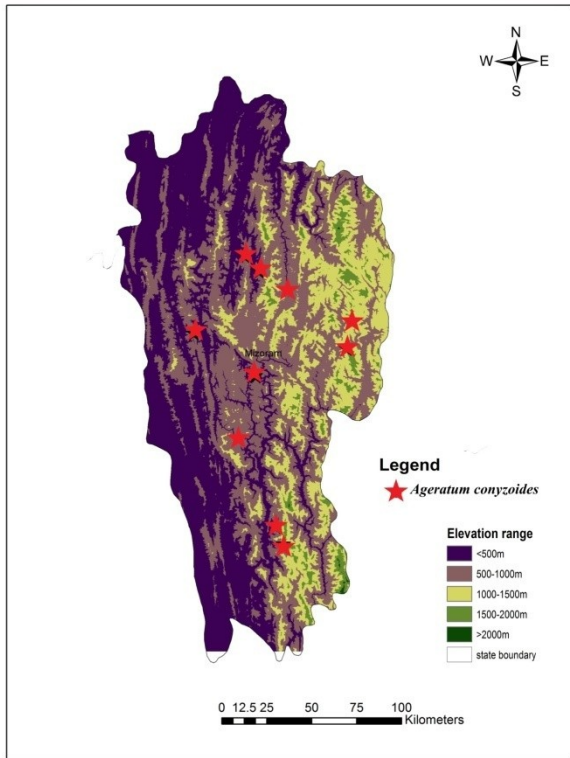
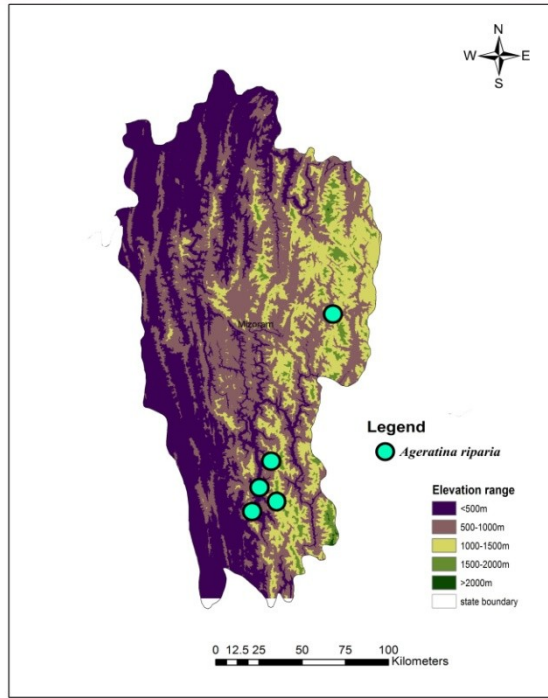
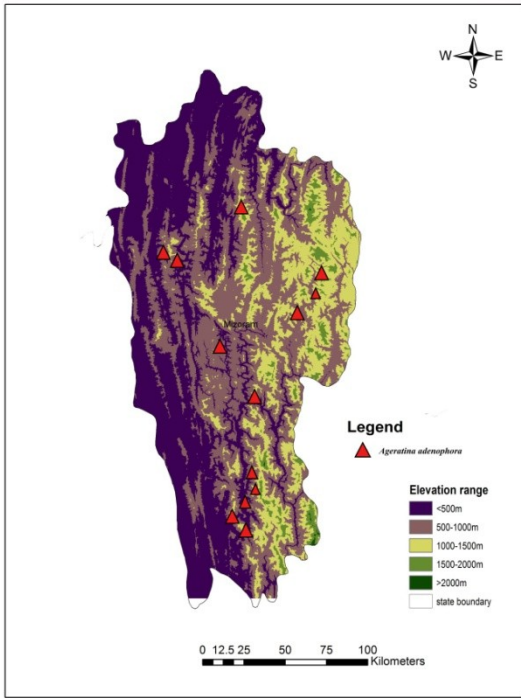
MIZORAM STUDY SITE CO-ORDINATES		
	Longitude(E)	Latitude(N)
Phawnhpui NP	93.04851	22.72714
	93.04838	22.72676
	93.04851	22.72419
	93.04853	22.71979
	93.04818	22.7155
	93.04819	22.71374
	93.04834	22.71303
	93.04937	22.71193
	93.04889	22.71093
	93.04738	22.7097
	93.05002	22.71137
	93.04739	22.71038
	93.0472	22.70675
	93.04664	22.70328
	93.0478	22.70096
	93.05155	22.69924
	93.05377	22.69528
	93.05917	22.69346
	93.05934	22.69328
	Murlen NP	93.06056
93.05409		22.69017
93.37625		23.70612
93.38297		23.70409
93.37782		23.6965
93.34792		23.66955
93.34774		23.66955
93.34639		23.65168
93.34456		23.64219
93.34471		23.64003
93.34442	23.63661	
93.34697	23.62605	

Lengteng WLS	92.7169	23.73702
	92.79829	23.72225
	92.80148	23.72141
	92.81374	23.74184
	92.81735	23.74234
	92.83917	23.73493
	92.86437	23.72214
	92.87176	23.7127
	92.87765	23.71321
	92.88404	23.69012

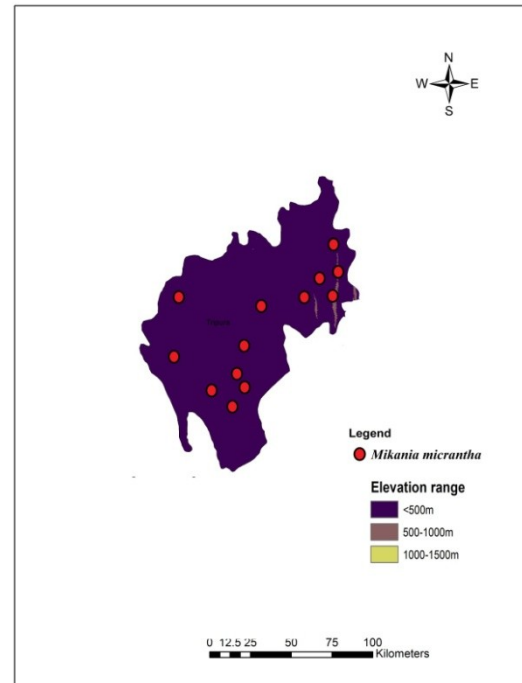
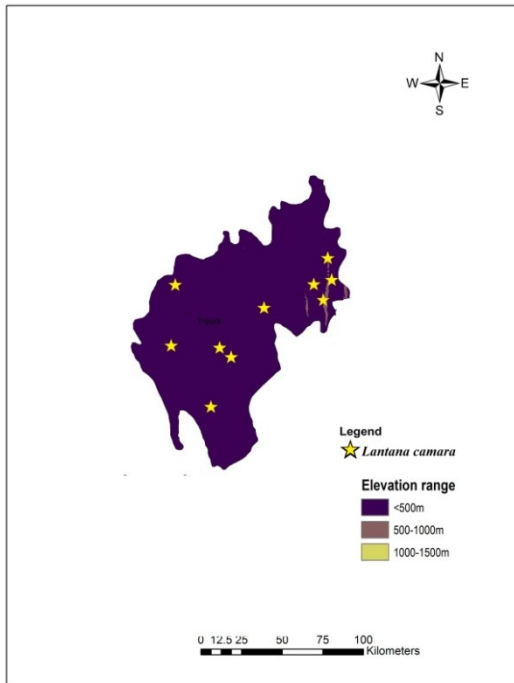
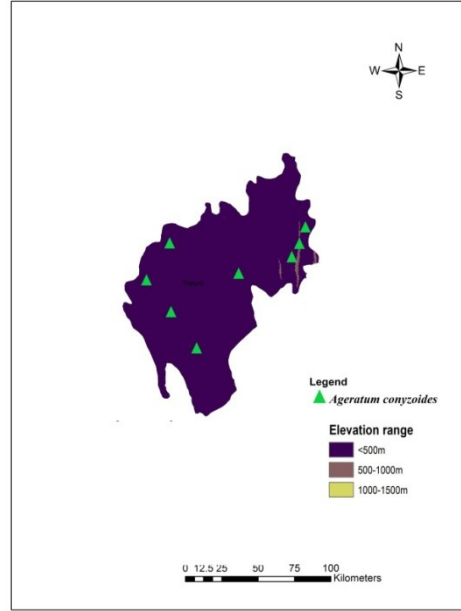
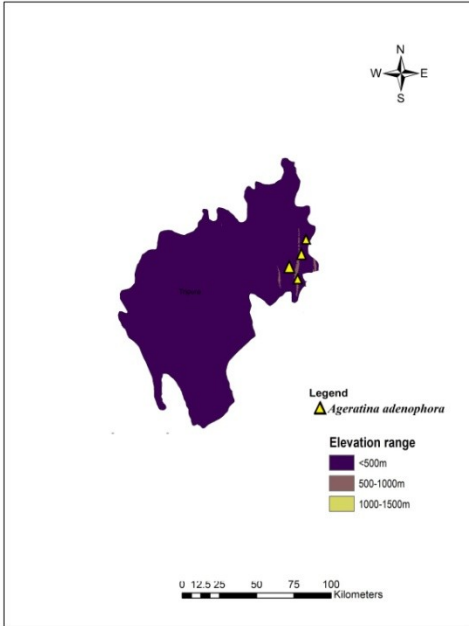
TRIPURA STUDY SITE CO-ORDINATES			
	Longitude(E)	Latitude(N)	
Gomati WLS	91.76521	23.41451	
	91.78127	23.41658	
	91.79188	23.41268	
	91.79883	23.41533	
	91.81096	23.42307	
	91.81251	23.42363	
	91.82577	23.42533	
	91.82686	23.42442	
	91.82684	23.42443	
	91.82682	23.42444	
	Trishna WLS	91.40071	23.28034
		91.40219	23.27843
		91.40246	23.27649
		91.40237	23.27805
91.40264		23.28077	
91.40235		23.28233	
91.40039		23.28269	
91.40198		23.28039	
Rowa WLS	91.39812	23.28108	
	91.39808	23.28111	
	92.14668	24.23548	
	92.1534	24.28022	
	92.1652	24.29057	
	92.16798	24.29161	
	92.16812	24.29183	
	92.16815	24.29187	
92.16856	24.2931		

	92.16608	24.29378
	92.16502	24.29463
	92.16438	24.29388
Vanghmun	92.18752	24.25465
	92.1999	24.21969
	92.20539	24.18159
	92.20928	24.13675
	92.20259	24.09436
	92.19907	24.04721
	92.24383	24.03768
	92.24383	24.03768
	92.27735	24.05838
	92.27975	24.01056

Map of the study sites in Mizoram



Map of the study sites in Tripura

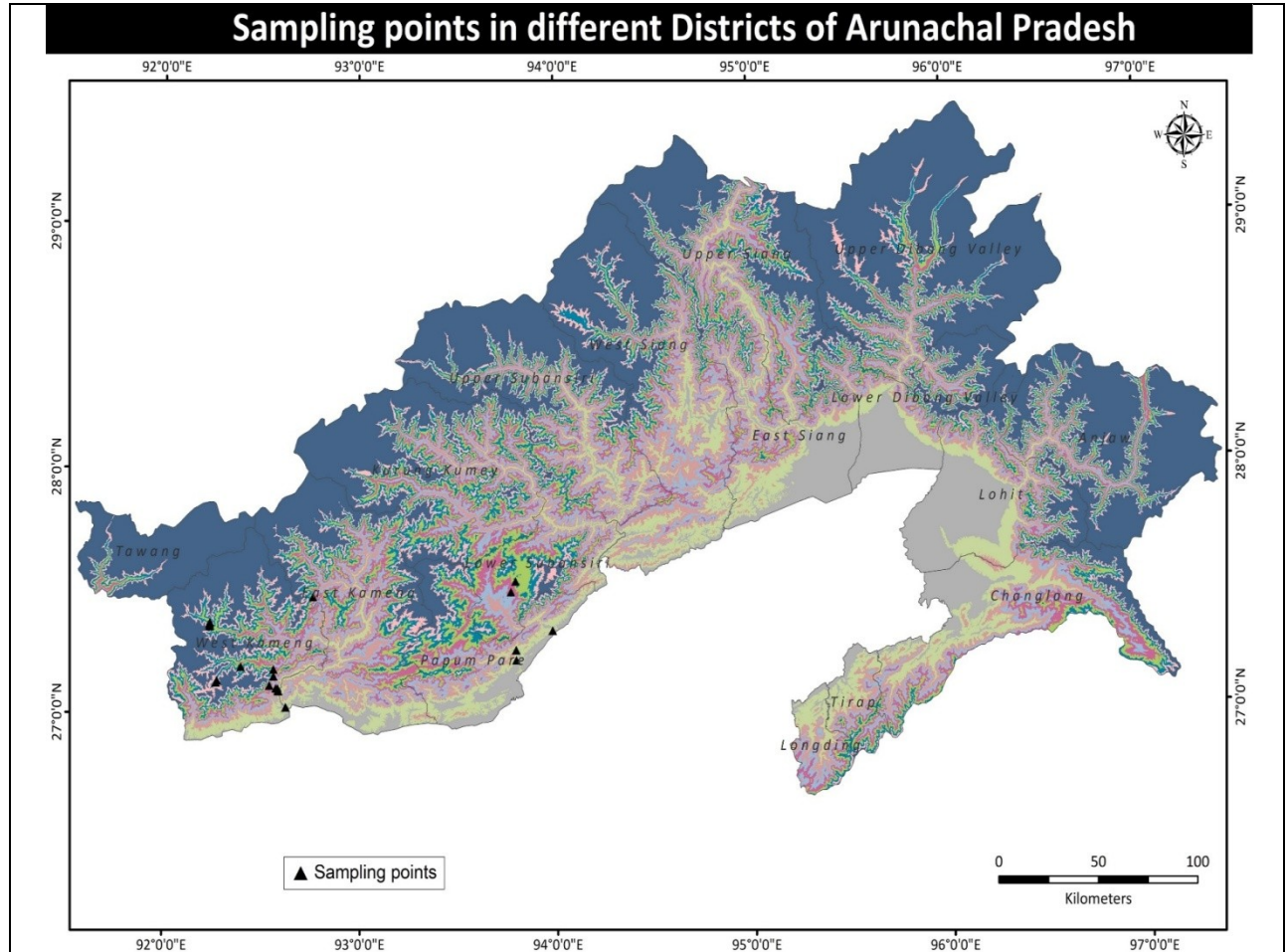


SITE DETAILS AND MAPS
(Arunachal Pradesh, Nagaland & Manipur)

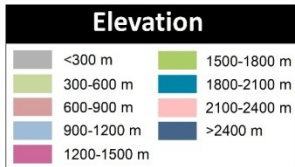
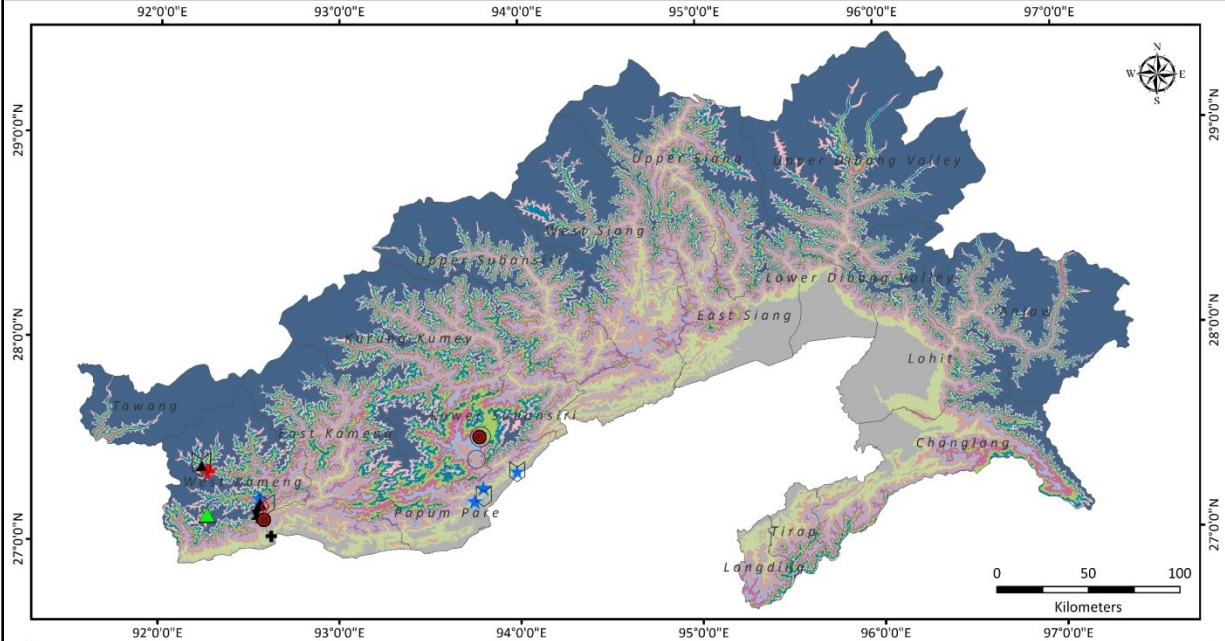
List of localities studied during the period with their respective GPS co-ordinates and elevations.

Locality	Elevation (amsl)	Elevation Range (amsl)	GPS co-ordinates
ChhotoBegra, Jiribam, MN	33m	<300m	N 24°40'49.2" E 93°06'40.2"
Lamdeng, Imphal West, MN	811m	600-900m	N 24°50'11.1" E 93°53'22.8"
Nongmaiching, Imphal East, MN	1120m	900-1200m	N 24°47'38.9" E 94°02'41.1"
Laimaton, Senapati, MN	1432m	1200-1500m	N 24°41'54.3" E 93°44'09.7"
Kwatha, Tengenoupal, MN	338m	300-600m	N 24°20'10" E 94°17'06"
Kwatha Khunou, Tengenoupal	218m	<300m	N 24°19'40" E 94°19'96"
Lairouching, Senapati, MN	1270m	1200-1500m	N 25°22'40.7"E 94°04'57.8"
Bhalukpong, West Kameng, AP	199m	<300m	N 27°01'20.2" E 92°37'27.1"
Nechiphu, West Kameng, AP	1699m	1500-1800m	N 27°09'57.1" E 92°34'51.3"
Old Sagalee road, Papum Pare, AP	551m	300-600m	27°11'54.9"N E 93°44'54.4"

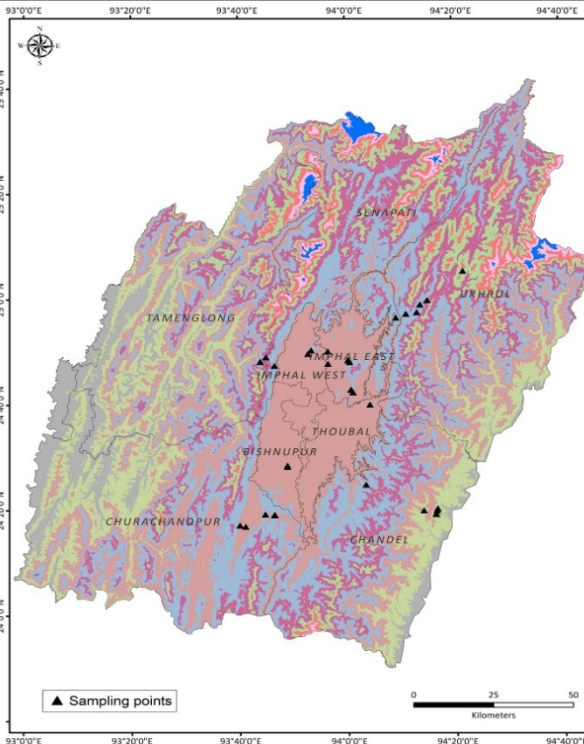
Sampling points in different Districts of Arunachal Pradesh



Sampling points in different Districts of Arunachal Pradesh

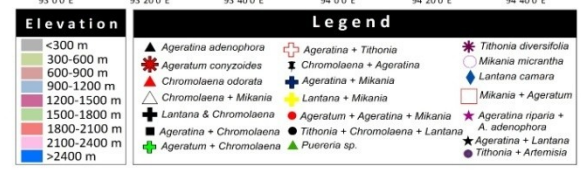
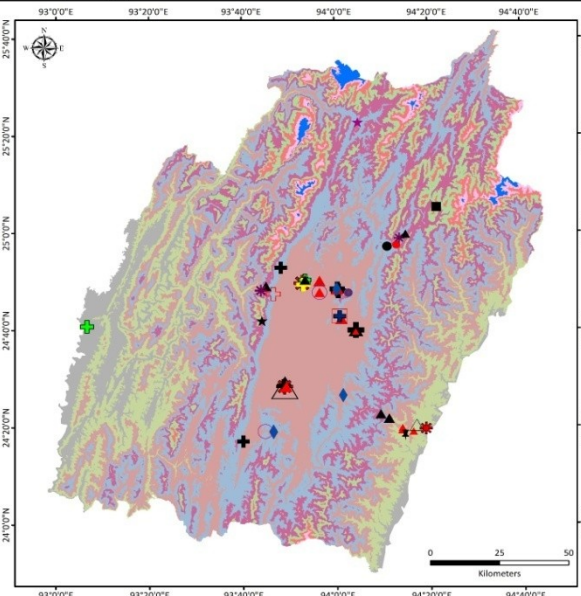


Sampling points in different Districts of Manipur



▲ Sampling points

Sampling points in different Districts of Manipur



Field Photographs
(Jammu & Kashmir, Ladakh)



Plate 1: (A) & (B) *Phragmites australis* L., (C) *Lepyrodictis holosteoides* L., (D) *Iris lactea* L., (E) *Medicago falcate* L. (F) *Convolvulus arvensis* L.



annexure-iv (b)

**Field Photographs
(Himachal Pradesh)**





**Field Photographs
(Uttarakhand & Himachal Pradesh)**



**Field Photographs
(Sikkim & Darjeeling)**



Targeted Species:(a) *Lantana camara* L. (b) *Ageratina adenophora* (Spreng.) R.M.King & H.Rob. (c) *Mikania micrantha* Kunth (d) *Chromolaena odorata* (L.) R.M.King & H.Rob.





Research team during field

**Field Photographs
(Tripura & Mizoram)**



Inaugural of the One day Awareness Programme





Field demonstration and certificate distribution in one day awareness programme





Invasive spread of *Ageratina adenophora* in Phawngpui national park



Invasive spread of *Mikania micrantha*



Invasive spread of *Lantana camara*



Tithonia diversifolia habit



Galinsoga parviflora habit



Invasive spread of *Ageratina adenophora* with seeds



Invasive spread of *Erigeron canadensis* with seeds



Invasive spread (White colour spikes) of *Imperata cylindrica*

**Field Photographs
(Arunachal Pradesh, Nagaland & Manipur)
Vermicompost Photos**



Compost bins set up



Chromolaena odorata compost



Mikania micratha compost



Earthworm faeces



Ageratum conyzoides compost



Lantana camara compost



Seedlings transplant

it



Ageratum conyzoides seedlings



Germination experiment replicates



Ageratum conyzoides seedlings



Amaranthus spinosus



Alternanthera philoxeroides Locality- Jiribam, MN





Chromolaena odorata and *Mikania micrantha*, Kwatha, MN



A. riparia observed along with *A. Adenophora*, Lairouching, MN.



Mucuna bracteata, Kwatha, MN



Mucuna bracteata flower, Kwatha, MN



Forest invaded by *Ageratum conyzoides* and *Mikania micrantha*, Kwatha Khunou, MN.



L. camara Invasion, Jiribam, MN



M. micrantha Invasion, Jiribam, MN



Mucuna bracteata, invasion, MN

Arunachal Pradesh Study Sites Photos



Thickets of *Lantana camara* invasion along with *Mikania micrantha*, Old Sagalee road, A.P



Thickets of *Ageratum houstonianum* , Old Sagalee road, A.P



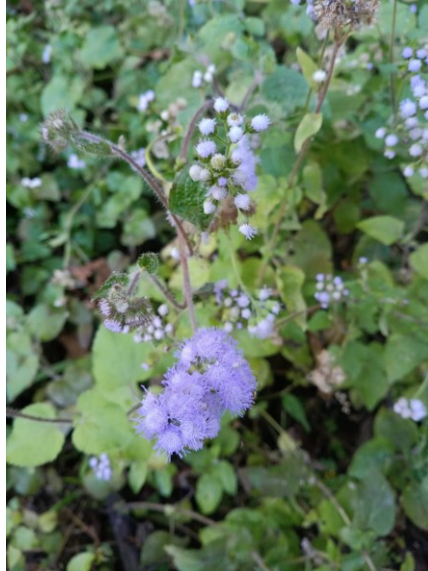
Site- Bhalukpong, West Kameng



L.camara invasion, Midpu, A.P



Crassocephalum crepidioides



A. conyzoides and *A. houstonianum*



Euphorbia hirta



Sida acuta



Synedrella nodiflora



Siegesbeckia orientalis



Scoparia dulcis

Project Team Photograph



Field Visit, Kwatha, MN



Manipur Chapter Workshop-Cum Training Program, MU, Imphal, MN



Field Trip, Kwatha, MN



Field Trip, MN



Field Trip, Old Sagalee Road,



Field Trip, Old Sagalee Road, A.P.



Field Trip, Old Sagalee Road, A.P.



Field Trip, Old Sagalee Road, A.P.

Arunachal Pradesh Chapter Workshop-Cum Awareness Program



Workshop-Cum Training Program Manipur Chapter



Workshop Inauguration