



FLORISTIC INVENTORY OF DHOSI HILL REGION BORDERING HARYANA AND RAJASTHAN IN INDIA

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Abstract

The basic aim of this study was to provide floristic inventory of existing floral diversity of Dhosi Hills bordering Haryana and Rajasthan, India. For this purpose, field surveys were conducted from June 2011 to February 2014. A total of 119 plant species belonging to 102 genera were identified. Out of the total 49 families reported in the study area, Fabaceae was the largest family that contributed 10 species (8.4%), followed by Asteraceae family with 8 species (6.7%), Euphorbiaceae with 7 species (5.8%), Mimosaceae with 6 species (5%) and Apocynaceae, Caesalpiniaceae, Solanaceae (families) with 5 spp., (4.2%) each; while 7 families contributed 3 species (2.5%) each. The human induced activities coupled with aridity and allelopathic behaviour of certain alien invasive plant species has led to decline the floristic wealth of this region.

Key words : Biodiversity, Dhosi hill, ethnobotany, floristic, inventory, invasive plant, Haryana.

Introduction

Floristic studies particularly understanding the natural distribution of plants is central to conserving biodiversity and managing ecosystems for long-term viability and sustainability. Floristic studies are very important to assess the baseline data about the account of any particular group of plants both as taxonomically and ethnobotanically. Inventorisation of vegetation by plant taxonomists is a common practice throughout the world to have baseline information about plants. Floristic inventory is necessary to understand and conserve the present biodiversity and it also acts as basic tool for the fundamental research. Through floristic inventories, a lot of valuable data is recorded, which could be used as reference for future studies. The knowledge of local flora is very important to predict the future impact of climate change on vegetation and ecosystem.

About the significance of floristic studies, Barkley (2000) has eloquently written, "Floristic studies filter and assimilate the accumulated wisdom of the plants of a region and couple it to those who use the information." Floristic inventories are of utmost value to basic research because the data generated through these inventories are highly useful in ecological, biogeographic, taxonomic and evolutionary studies. Knowledge generated by floristic

inventories is utilized by a breadth of applied research fields including land management, forestry, conservation biology, ecology, and range science. It forms the basis for regional floras and systematic monographs.

Though, a large number of floristic studies have been conducted in India and abroad (Sinha and Das, 2000; Das and Das, 2005; Reif, 2006; Flaig, 2007; Parveen and Hussain, 2007; Al-Gohary, 2008; Kamal-Uddin *et al.*, 2009; Kuhn, 2009; Reddy and Pattanaik, 2009; Qureshi and Bhatti, 2010; Yavari and Shahgolzari, 2010; Qureshi *et al.*, 2011; Sher *et al.*, 2011; Rahman *et al.*, 2012; Uddin and Hassan, 2012; Abbas *et al.*, 2013; Khatun *et al.*, 2013 and Rathod, 2013). Though, a few floristic and ethnobotanical studies have been undertaken in different parts of the Haryana also (Yadav and Kumar, 2003; Yadav *et al.*, 2004; Yadav *et al.*, 2010 and Yadav and Bhandoria, 2013) but meagre information is available on the flora of Dhosi hills of Haryana.

The aim of this study is to provide baseline information of the existing flora of Dhosi Hills and to develop herbarium at Maharshi Dayanand University, Rohtak (Haryana), India. The present study is, therefore the first attempt to make an inventory and analysis of the entire flora of Dhosi hill based on extensive field studies. This is first report of the seasonal flora of the study area.

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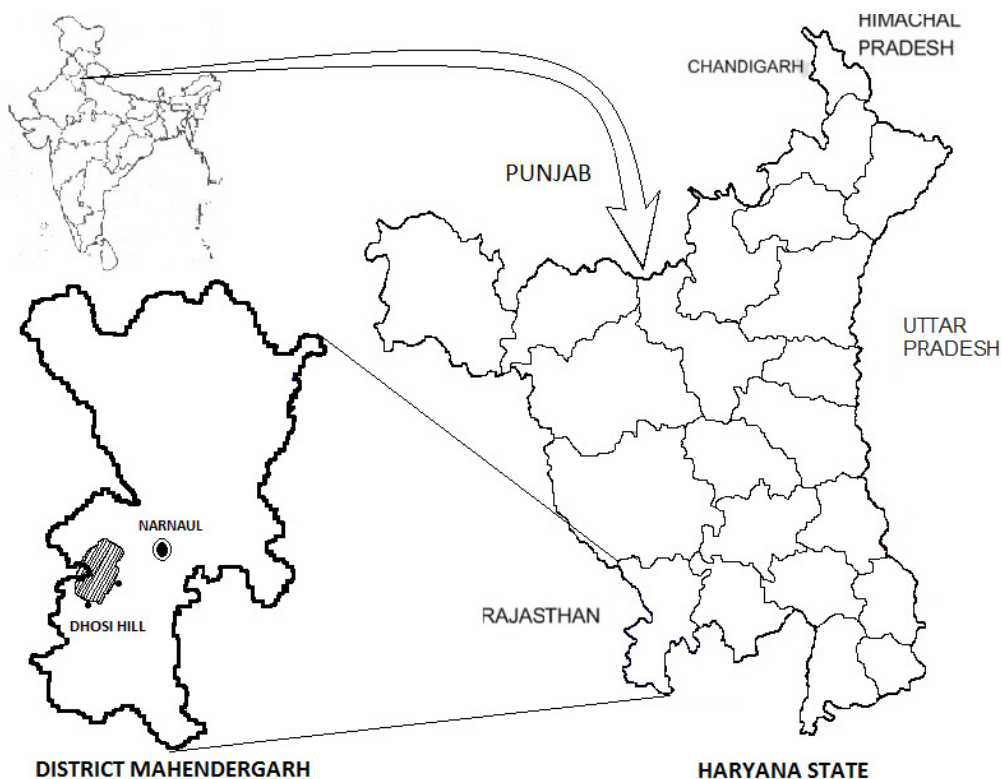


Fig. 1 : Map showing study site.

Materials and Methods

Study site description

In revenue records the present ownership of the hill belongs to three villages 'Dhosi' in district Jhunjhunu in the state of Rajasthan, villages 'Thana' and 'Kultajpur' in the Mahendergarh district of Haryana state (fig. 1).

The three villages are inhabited on the three waterfalls, which get activated during monsoons in the months of July-August, originating from the water reservoir on the hill top. Dhosi hill is revered by Hindus since its eruption. It has several mentions in Sanskrit books. This hill is popularly known as the place where Chavan Rishi practised penance for several years. The temple on the top of the Dhosi Hill dedicated to Chavan Rishi, is visited by large number of devotees. Several fairs take place on the hill on various festivals and special days. The hill provides tourism opportunities to various categories of tourists. An ancient sacred water reservoir for storing rain water for bathing for pilgrims is located on the hill for centuries. The rain water stored in the sacred water reservoir carries some rejuvenating properties and treatment for skin ailments. The water in the reservoir becomes herbal and 'Cupric' because of good quantity of Copper metal in the hill and growth of rare herbs in large quantities.

Methodology

In order to attain the goal of determining the presence of species in the study area, we used the reconnaissance method of floristic survey and the survey was done on foot in the different seasons around the year. The study site was further divided into five sub locations which were further divided into five blocks in such a way that atleast one should lie in east, west, north, south and centre of the study site. At each location quadrats of appropriate size were laid to assess the distribution pattern of plant species and at each collection location occurrence of plant species and other notable field characteristics were recorded in the field notebook. Before collecting the specimen, photographs in natural habitat were also taken. Collections were made only if ten or more individuals were present in a plant population. Small plants were collected as whole and large plants were collected in the form of flowering branches. Each specimen was given a voucher specimen number.

Just after collection, in the field itself, the specimens were treated with 10% formaldehyde solution for tissue desiccation. Thereafter, plant specimens were placed in between blotting paper folds in the field press machine for drying. Dried specimens treated with HgCl_2 (mercuric chloride) solution were fixed on prescribed herbarium sheets with adequate information. Plants were identified

Table 1: Alphabetic inventory of plants found in Dhosi hills.

S.no.	Botanical name	Family	Local name	Habit	Occurrence
1.	<i>Abrus precatorius</i> L.	Fabaceae	Chirmathi, rati	Climber	Rare
2.	<i>Acacia auriculiformis</i> (A.Cunn). Benth.	Mimosaceae	Ear leaf acacia	Large tree	Rare
3.	<i>Acacia leucophloea</i> (Roxb.) Wild.	Mimosaceae	Ronj	Large tree	Rare
4.	<i>Acacia nilotica</i> (L.) Wild. Ex Del.	Mimosaceae	Desi kikar	Large tree	Common
5.	<i>Acacia senegal</i> (L.) Wild.	Mimosaceae	Khairi	Medium size tree	Common on hilly tracts
6.	<i>Acacia tortilis</i> (Forssk.) Hayne.	Mimosaceae	Totlus kikar	Large tree	Common on roadsides
7.	<i>Manilkara zapota</i> (L.) P. Royen	Sapindaceae	Chikoo	Medium size tree	Rare
8.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Putkanda, Ulta kanta	Annual herb	Common
9.	<i>Adhatoda vasica</i> L.	Acanthaceae	Basaka, Aroosa	Annual herb	Very common
10.	<i>Aegle marmelos</i> (L.) Corr. Serr.	Rutaceae	Belpathar	Large tree	Rare
11.	<i>Ageratum conyzoides</i> L.	Asteraceae	Jangli Pudina	Annual herb	Common
12.	<i>Ailanthus excelsa</i> Roxb.	Simarubiaceae	Oloo neem	Large tree	Common
13.	<i>Albizia lebbek</i> (L.) Benth.	Mimosaceae	Siris	Large tree	Rare
14.	<i>Aloe vera</i> (L.) Burm. f.	Liliaceae	Gwar patha, ghikanwar	Annual herb	Rare
15.	<i>Alstonia scholaris</i> (L.) R.Br.	Apocyanaceae	Sapt-Parna, Devil tree	Large tree	Rare
16.	<i>Amaranthus viridis</i> L.	Amaranthaceae	Chaulai	Annual herb	Common
17.	<i>Annona squamosa</i> L.	Annonaceae	Sharipha, custard apple	Medium size tree	Rare
18.	<i>Anogeissus pendula</i> Edgew.	Combretaceae	Indokh, Dhok	Large tree	Rare
19.	<i>Argemone maxicana</i> L.	Papaveraceae	Jhaljai, satyanashi	Ephemeral herb	Very common
20.	<i>Asparagus racemosus</i> Wild.	Asparagaceae	Satavar	Annual herb	Rare
21.	<i>Azadirachta indica</i> A.Juss.	Meliaceae	Neem	Large tree	Very common
22.	<i>Bambusa multiplex</i> (Lour.) Raeusch. ex. Schult. & Schult. f.	Poaceae	Bans, Bamboo	Perennial cultivated herb	Rare
23.	<i>Barleria prinitis</i> L.	Acanthaceae	Pila Basa	Annual herb	Common
24.	<i>Bauhinia variegata</i> L.	Caesalpiniaceae	Kachnar	Medium size tree	Rare
25.	<i>Blumea lacera</i> (Burm. f.) DC Prodr.	Asteraceae	Jangli Mooli	Annual herb	Abundant weed
26.	<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	Santi, Punarnava	Annual prostrate herb	Abundant
27.	<i>Bombax ceiba</i> L.	Bombacaceae	Simbal	Large tree	Rare
28.	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Dhak	Large tree	Rare
29.	<i>Caesalpinia bonduc</i> (L.) Roxb.	Caesalpiniaceae	Kantikarenja	Shrub	Common in herbal parks
30.	<i>Calotropis gigantea</i> (L.) W.T.Aiton.	Asclepiadaceae	Aak	Perennial shrub	Common
31.	<i>Calotropis procera</i> (Ait.) Aiton.	Asclepiadaceae	Aak	Perennial shrub	Abundant

Table 1 continued...

Table 1 continued...

32.	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	Annual herb	Rare
33.	<i>Capparis decidua</i> (Forssk.) Edgew.	Capparaceae	Kair, Tint	Small tree	Common in community forests
34.	<i>Capparis sepiaria</i> L.	Capparaceae	Heens	Shrub	Common
35.	<i>Carissa carandas</i> L.	Apocyanaceae	Karaunda	Small tree	Rare
36.	<i>Cassia fistula</i> L.	Caesalpiniaceae	Amaltas	Large tree	Common
37.	<i>Cassia siamea</i> (Lam.) Irwin et Barneby	Caesalpiniaceae	Seemia, Kasood	Medium size tree	Common
38.	<i>Catharanthus roseus</i> (L.) G.Don.	Apocyanaceae	Sadabahar	Herb	Common
39.	<i>Cicer arietinum</i> L.	Fabaceae	Chana, Black gram	Herb	Common
40.	<i>Citrus medica</i> (L.) Burm. f.	Rutaceae	Nimbu,	Small tree	Rare
41.	<i>Cocculus hirsutus</i> (L.) Diels.	Manispermaceae	Farid buti	Twiner herb	Rare
42.	<i>Commiphora mukul</i> Engl.	Burseraceae	Guggal	Small tree	Rare
43.	<i>Corchorus trilocularis</i> L.	Tiliaceae	Wild jute	Annual herb	Common
44.	<i>Cordia dichotoma</i> G. Forst.	Boraginaceae	Lehsua, Lasura	Medium size tree	Common
45.	<i>Cordia gharaf</i> (Forsk.) Ehren.ex.Asch.	Boraginaceae	Gunan	Medium size tree	Rare
46.	<i>Coronopus didymus</i> (L.) Sm.	Brassicaceae	Jangli haloon	Annual herb	Very common
47.	<i>Crataeva adansonii</i> D.C. Prodr.	Capparaceae	Jangli Belpathar	Medium size tree	Rare
48.	<i>Crinum asiaticum</i> L.	Amaryllidaceae	Sukhdarshan	Annual herb	Common
49.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Doob ghas,	Runner herb	Abundant
50.	<i>Datura innoxia</i> Mill.	Solanaceae	Datura	Annual herb	Common
51.	<i>Delonix regia</i> (Boj. ex. Hook.) Raf.	Caesalpiniaceae	Gulmohar	Large tree	Rare
52.	<i>Ehretia laevis</i> Roxb.	Boraginaceae	Chhara	Large tree	Rare
53.	<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Amla	Large tree	Rare
54.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dudhi	Annual herb	Abundant
55.	<i>Euphorbia royleana</i> Bioss.	Euphorbiaceae	Danda thor	Perennial shrub	Common
56.	<i>Euphorbia tirucalli</i> L.	Euphorbiaceae	Pencil tree	Perennial shrub	Rare
57.	<i>Evolvulus alsinoides</i> (L.) L.	Convolvulaceae	Vishnukrantha	Annual herb	Common
58.	<i>Ficus benghalensis</i> L.	Moraceae	Bar,Bargad	Large tree	Common
59.	<i>Ficus infectoria</i> L.	Moraceae	Pilkhan	Large tree	Common
60.	<i>Ficus relegiosa</i> L.	Moraceae	Papal	Large tree	Common
61.	<i>Furcraea foetida</i> (L.) Haw.	Asparagaceae	Mauritius Hemp	Perennial cultivated herb	Rare
62.	<i>Glinus lotoides</i> L.	Molluginaceae	Gandhi-buti	Annual herb	Rare
63.	<i>Gnaphalium luteo-album</i> L.	Asteraceae	Cotton weed	Annual herb	Abundant weed
64.	<i>Grewia tenax</i> (Forsk.) Fiori.	Tiliaceae	Gangeran	Perennial shrub	Rare
65.	<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Gurhal	Small tree	Rare
66.	<i>Indigofera linnaei</i> Ali.	Fabaceae	Leel	Annual herb	Abundant
67.	<i>Jasminum multiflorum</i> (Burm.f.) Andrews.	Oleaceae	Chameli	Perennial herb	Rare

Table 1 continued...

Table 1 continued...

68.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Danti	Small tree	Rare
69.	<i>Lantana camara</i> L.	Varbenaceae	Lantana	Annual shrub	Common
70.	<i>Lawsonia inermis</i> L.	Nyctiginaceae	Mehndi	Shrub	Common
71.	<i>Leucas cephalotes</i> (Roth.) Spreng.	Lamiaceae	Dadghal, Draun pushpin	Annual herb	Common
72.	<i>Leucas ciliata</i> Benth.	Lamiaceae	Burumbi	Annual herb	Rare
73.	<i>Lindenbergia ruderalis</i> Kuntze.	Scrophulariaceae	Lindenbergia	Annual herb	Common on hills
74.	<i>Lycium cooperi</i> A.Grey.	Solanaceae	Mureli	Medium size tree	Rare
75.	<i>Maytenus emarginata</i> (Wild.) Hou.	Celasteraceae	Kakera	Medium size tree	Very rare
76.	<i>Melia azadirach</i> L.	Meliaceae	Bakayan	Large tree	Very common
77.	<i>Melilotus indicus</i> (L.) Pall.	Fabaceae	Senji, Metha	Annual herb	Abundant weed
78.	<i>Melothria maderaspatana</i> (L.) M. Roem	Cucurbitaceae	Aankh phod	Climber herb	Rare
79.	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Kadhi patta	Small tree	Rare
80.	<i>Nyctanthes arbor tristis</i> L.	Oleaceae	Harsingar	Small tree	Rare
81.	<i>Ocimum americanum</i> L.	Lamiaceae	Nagad bavchi	Annual herb	Abundant
82.	<i>Ocimum sanctum</i> L.	Lamiaceae	Tulsi	Herb	Common
83.	<i>Pedilanthus tithymaloides</i> L.	Euphorbiaceae	Devil's backbone	Perennial cultivated herb	Common
84.	<i>Pergularia daemia</i> Forsk. Chiov.	Asclepiadaceae	Gadaria ki bel	Annual twiner herb	Common
85.	<i>Pithecellobium dulce</i> (Roux.) Benth.	Fabaceae	Jangle jalebi	Large tree	Rare
86.	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Chitrak	Herb	Rare
87.	<i>Portulaca pilosa</i> L.	Portulacaceae	Lunkhi	Annual herb	Common
88.	<i>Prosopis cineraria</i> (L.) Druce.	Fabaceae	Janti, jand	Large tree	Abundant
89.	<i>Prosopis juliflora</i> (Sw.) DC.	Fabaceae	Vilayati kikar	Medium size tree	Abundant
90.	<i>Psidium guajava</i> L.	Myrtaceae	Amrood, guava	Medium size tree	Rare
91.	<i>Pulicaria crispa</i> (Forsk.) Oliv.	Asteraceae	Pili bui	Annual herb	Rare
92.	<i>Punica granatum</i> L.	Punicaceae	Anar, Pomegranate	Small tree	Rare
93.	<i>Pupalia lappacea</i> (L.) Juss.	Amaranthaceae	Gugga, Bharunt	Annual herb	Common
94.	<i>Putranjiva roxburghii</i> Wall.	Euphorbiaceae	Putranjeeva	Medium size tree	Rare
95.	<i>Rauwolfia serpentine</i> (L.) Benth. ex.Kurz.	Apocyanaceae	Sarpgandha	Perennial shrub	Rare
96.	<i>Rhus mysorensis</i> Don.	Anacardiaceae	Dansar	Perennial shrub	Very rare
97.	<i>Rosa indica</i> L.	Rosaceae	Gulab, Rose	Cultivated shrub	Rare
98.	<i>Saccharum officinarum</i> L.	Poaceae	Ganna	Herb	Rare
99.	<i>Salvadora persica</i> Wall.	Salvadoraceae	Jal, Meswak	Large tree	Common
100.	<i>Sida cordifolia</i> L.	Malvaceae	Kharinti	Annual herb	Common
101.	<i>Sisymbrium irio</i> L.	Brassicaceae	Khoobkalan	Annual herb	Abundant
102.	<i>Solanum nigrum</i> L.	Solanaceae	Makoy	Annual herb	Common

Table 1 continued...

Table 1 continued...

103.	<i>Solanum surattense</i> Burm. f.	Solanaceae	Katehli	Annual herb	Rare
104.	<i>Sonchus asper</i> (L.) Gars.	Asteraceae	Dudhi	Annual herb	Very common
105.	<i>Spergula arvensis</i> L.	Caryophyllaceae	Jangli dhania	Annual herb	Very common
106.	<i>Syzygium cumini</i> (L.) Skeels.	Myrtaceae	Jamun	Large tree	Rare
107.	<i>Tamarindus indica</i> L.	Fabaceae	Imli	Large tree	Rare
108.	<i>Tephrosia perpurea</i> (L.) Pers.	Fabaceae	Jhohhru	Annual herb	Abundant
109.	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	Arjun	Large tree	Rare
110.	<i>Thevetia neriiifolia</i> Juss.	Apocyanaceae	Pila Kaner	Small tree	Common
111.	<i>Tinospora cordifolia</i> (Thunb.) Miers.	Manispermaceae	Giloy	Annual twiner	Very common
112.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Bhankhri	Stragglng herb	Abundant
113.	<i>Trichodesma indicum</i> (L.) Lehm.	Boraginaceae	Chhota Kapla	Annual herb	Rare
114.	<i>Tridax procumbens</i> L.	Asteraceae	Sadahari	Annual herb	Common
115.	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Sahadevyi	Annual herb	Common
116.	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Aswgandha, Akshan	Annual herb	Common
117.	<i>Xanthium strumarium</i> L.	Asteraceae	Maskhara	Annual herb	Common
118.	<i>Zaphranthes grandiflora</i> Lindl.	Amarylidaceae	Lily	Herb	Rare
119.	<i>Zizyphus jujuba</i> Mill.	Rhamnaceae	Ber	Medium size tree	Common

with the available literature, flora, photographs and confirmed by visiting nearby herbaria of University of Rajasthan, Jaipur, Delhi University, New Delhi, Panjab University, Chandigarh and M.D.S. University, Ajmer, India. The species names were also tallied with plant names given in the International plant list available in the website. Collected specimens were deposited in the Ecology and Floristic Laboratory, Department of Botany, Maharshi Dayanand University, Rohtak (Haryana) India.

Results and Discussion

Dhosi hill has remained an important herbal centre since the ancient times because of occurrence of rare medicinal herbs. The basic aim of this study was to enumerate the existing flora of Dhosi hill area. This floristic inventory represents the results of intensive collecting of vascular plants throughout the study area. In the present study, total 119 plant species belonging to 49 families were identified. The alphabetic list of plants of Dhosi hill is given in table 1. The whole list comprises 112 dicots and 7 monocots. Herbs are dominating the area with 48.7% followed by trees 42.9% then shrubs with 8.4%. According to FIV (family importance value) the family Fabaceae having 10 (8.4%) species is the most dominating followed by Asteraceae with 8 (6.7%), Euphorbiaceae with 7 (5.9%), Mimosaceae with 6 (5.0%) species. It is

followed by Apocynaceae, Caesalpinaceae and Solanaceae with 5 species each and Lamiaceae with 4 species. In this study, site seven families contributed 3 species each while 13 families contributed 2 species each and rest 22 families are represented by only one plant species in the study area.

The distribution of plant species were also assessed on ecological five point scale for their distribution and it was observed that 15 plant species were present in 100% location of the study site and are termed as abundant in distribution, 7 plant species were present in 80% locations and are termed as very common followed by 43 plant species as common present in 60% study locations, 52 plant species as rare and 2 plant species as very rare plants as they found only less than 40% and 20% surveyed locations. Here, it is pertinent to mention that this distribution pattern is relevant only for the flora of Dhosi hill region and occurrence of plant species may vary in different regions, because distribution is determined by many factors *viz.* Edapho-climate conditions, topography, slope and anthropogenic disturbances. Uncontrolled grazing, unsustainable collection and utilization of plants for different purposes cause a great threat to the flora of Dhosi hills.

The knowledge of the vegetation structure of an area is the major requirement for any ecological and

biodiversity conservation strategies (Yavari and Shahgolzari, 2010). Floristic data are integral requirement for any biodiversity conservation and management programmes (Mace, 2004). Such floristic studies may act as a positive force for biodiversity (Novacek, 2008 and Webb *et al.*, 2010). Significance of taxonomic data for biodiversity conservation has been highlighted and discussed at scientific level by Wheeler, 2004; Raczkowski and Wenzel, 2007 and Mayo *et al.*, 2008.

The Dhosi hill area has great archaeological, ecological, religious, spiritual and mythological significance and this region has also been declared as protected site by Archaeology Survey of India and Forest Department, Government of Haryana state. Vegetation in this region is already under severe threat due to low and erratic rainfall and overexploitation by local people. The results of this comprehensive inventory will be used to prioritize species for management based on their threat to ecosystems and at risk species in the Dhosi hill. The human induced activities coupled with aridity and allelopathic behaviour of certain alien invasive plant species has led to decline the floristic wealth of this region. The baseline information in the form of floristic inventory may be highly useful for future ecological work such as rehabilitation and conservation of the flora of the area. We firmly believe that a vast increase in biodiversity exploration is necessary, if we are to even begin to document species and their distribution in the region before they become extinct. In the light of above findings, it is recommended that a long term comprehensive study should be undertaken to document the ecological status of complete flora of the study area.

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