Applied Ecology and Environmental Sciences, 2013, Vol. 1, No. 4, 49-54
Available online at http://pubs.sciepub.com/aees/1/4/3

DOI:10.12691/aees-1-4-3

Floristic Diversity of Kandi Region of Hoshiarpur, Punjab, India

Laxmi Rawat[1], R. K. Manhas[2,*], Deepak Kholiya[1], S. K. Kamboj[1]

[1]Forest Ecology & Environment Division, Forest Research Institute, Dehradun, Uttarakhand, India
[2]Department of Botany, Govt. Degree College, Kathua, India
*Corresponding author: manhasrk@rediffmail.com

Received January 12, 2013; Revised March 24, 2013; Accepted June 07, 2013

Abstract Present study was conducted in the Kandi region of Hoshiarpur, India. Kandi region is the transitional zone between the Siwaliks and the plains. Field trips were undertaken weekly in all parts of the study site and plants were collected during each trip. Herbaceous flora was excavated as a whole whereas in case of shrubs and trees, only the tender twigs bearing flowers and/or fruits were taken. The dried specimens were mounted on the herbarium sheets. These herbarium sheets were protected against damages by poisoning them with 1% mercuric chloride and naphthalene balls. Total 176 plant species belonging to 57 families and 133 genera were recorded from the study site. Out of these 176 plants, 175 were angiosperms and 1 was gymnosperm. The contribution of dicotyledons was 78.3% (137 species and 105 genera) and monocotyledons 21.7% (38 species and 27 genera). Poaceae was the most dominant family with 30 species and 21 genera. Other important families were Papilionaceae, Caesalpiniaceae, Euphorbeaceae, Apocynaceae, Acanthaceae and Mimosaceae. The most dominant life form was trees (36.9%), followed by shrubs (22.7%), grasses (17.1%), herbs (13.6%), climbers (8.5%) and sedges (1.1%). Studies of forest flora provide useful information on several aspects related to species diversity like dominant families, life-form status etc. The researchers and forest managers can exploit this information in planning of sustainable utilization of these resources. Time to time assessment of species diversity also helps in studying the impact of temporal changes like climate change on species distribution.

Keywords: *grazing, life-form, papilionaceae, poaceae, shiwaliks*

Cite This Article: Rawat, Laxmi, R. K. Manhas, Deepak Kholiya, and S. K. Kamboj "Floristic Diversity of Kandi Region of Hoshiarpur, Punjab, India." *Applied Ecology and Environmental Sciences* 1, no. 4 (2013): 49-54. doi: 10.12691/aees-1-4-3.

1. Introduction

The Kandi region spanning from Kashmir region, Punjab and Haryana is the transitional zone between the Siwaliks and the plains [1]. Kandi area of Punjab is a sub-mountainous zone that stretches in a thin belt along the northeastern border of the state of Punjab, and comprises the Punjab Shiwaliks and strip of undulating land below the hills in the districts of Gurdaspur, Hoshiarpur, Fatehgarh Sahib and Ropar, with a length and width of 161 km and 10 km, respectively.

Punjab has 84% of its total geographical area under agriculture and only 6.07 % under forests. The majority of forest area of the state is in the form of block forests in Shiwalik hills or Kandi region. Champion and Seth [2] categorize these forests as Dry Deciduous thorn scrub forests. About 83 percent of the forest area in the Kandi belongs to the local communities and private individuals. Private forests include those owned by individuals, groups of individuals or the Panchayat. The Forest Department exercises control over these forest areas under the Land Preservation Act, 1900. This area constitutes about 52 percent of the total forest areas in the State.

The pressures on the forests for fuel-wood and fodder did not allow regeneration. Fires, which generally broke out in the summer destroys whatever remains. Most of the forest areas are infested by *Lantana camara* and *Parthenium hysterophorus*, two of most obnoxious weeds of the world. For all these reasons, the Kandi region is one of the most degraded areas of Punjab. With increase in population pressure (human and cattle) and subsequent overexploitation of renewable resources has ultimately affected the carrying capacity of the system.

The earliest record of plants from Punjab are found in Stewart [3] who published a book on 'Punjab Plants' and Atchinson [4] published a list of plants of Hoshiarpur district. Other significant contributors towards the listing of flora of Punjab are Bamber [5], Parker [6], Nair [7], Sharma and Khosla [8], Sharma [9], Sharma *et al.* [10] and Manhas *et al.* [11]. Studies of forest flora provide useful information on several aspects related to species diversity, besides other valuable information like dominant families, life-form status etc. Keeping the importance of the subject in mind, the present study was undertaken in the Kandi area of Punjab with an objective of listing the plants of Kandi region of Hoshiarpur, so that the importance of the flora of this region is recognized and

some strategies are formulated for their conservation and sustainable use.

2. Material and Methods

2.1. Study Site

Present study site is located between 31° 31′ and 31°53′ N latitude, 75° 55′ and 75°92′ E longitude. It has an average elevation of 296 m (971 feet). May and June are the hottest months of the year during which the temperature rises to 45°C. The average annual rainfall for the last five years is 832.32 mm. Most of the rainfall is received during monsoon from July to September (Figure 1).

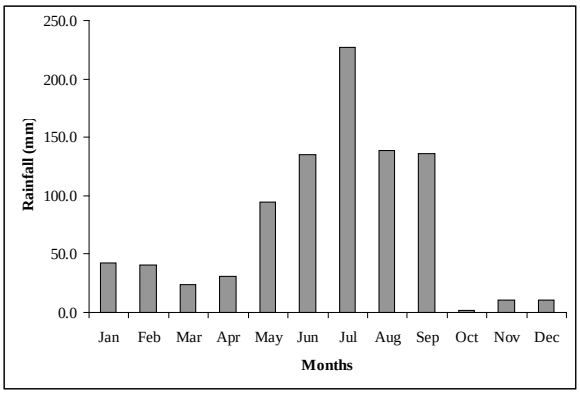

Figure 1. Rainfall (mm) of the study area for the last five years (2001-2005)

Hoshiarpur falls into two nearly equal portions of hill and plain country. Its eastern face consists of the westward slope of the Solar Singhi Hills; parallel with that ridge, a line of lower heights belonging to the Shiwalik Range traverses the district from south to north, while between the two chains stretches a valley of uneven width, known as the Jaswan Dun. Its upper portion is crossed by the Sohan torrent, while the Sutlej sweeps into its lower end through a break in the hills, and flows in a southerly direction until it turns the flank of the central range, and debouches westwards upon the plains.

2.2. Methodology

Floristic trips were undertaken weekly in all parts of the study site. Plants were collected during each trip and while collecting plants, voucher numbers was allotted to each specimen and details entered into the field notebook. Field data collected for every specimen included place of collection, altitude, date of collection, voucher number, flower color, fragrance and other such characters, which are not retained on pressing. Herbaceous flora excavated as a whole whereas in case of shrubs and trees, only the tender twigs bearing flowers and/or fruits were taken. Care was taken to collect a disease free specimen. The plants collected were pressed at the earliest in old newspapers and blotters. The pressing of plant specimens was carried out with the help of wooden press having four nut and bolts for tightening. The dried specimens were mounted on the herbarium sheets using glue and finally by stitching them at required places with the help of cotton thread. Glued pieces of paper were fixed over the knots at the back of the sheet to prevent them from getting loose with the passage of time. Herbarium sheets were protected against damage from insects by poisoning them with 1% mercuric chloride. Naphthalene balls were also used to keep the insects away from the Herbarium.

The specimens were identified either directly with the help of the herbariums of B. S. I. Northern Circle Dehradun and Herbarium of F. R. I., Dehradun or indirectly using local floras [6,7,8,9,10]. The voucher specimens were submitted to the Forest Department of Punjab, Chandigarh, India.

3. Results and Discussion

Total 176 plant species belonging to 57 families and 133 genera were recorded from the study site (Table 1). Out of 176 plants, 175 were angiosperms and 1 gymnosperm. The contribution of dicotyledons was 78.3% (137 species and 105 genera) and monocotyledons 21.7% (38 species and 27 genera).

Table 1. List of plant species present in Hoshiarpur, Punjab

Botanical names of plant species	Family	Local names	Habits
Adhatoda vasica Linn.	Acanthaceae	Besuti, Arusha	Shrub
Barleria cristata Linn.	Acanthaceae	Kala bansa	Shrub
Justicia gendarussa Burm. F.	Acanthaceae	Hedge plant	Shrub
Justicia heterocarpa T. Anders.	Acanthaceae	Had-pat	Herb
Justicia prostrata (Cl.) Gamble	Acanthaceae	Had-pat	Herb
Peristrophe paniculata (Forssk.) Brummitt	Acanthaceae	Peristrophe	Herb
Achyranthus aspera Linn.	Amarantaceae	Chirchara, Latjira	Shrub
Aerva javanica Juss ex Schult.	Amarantaceae	Boi-Kalan, Dholimundi	Herb
Aerva lanata Juss ex Schult.	Amarantaceae	Kapur-madhura	Herb
Aerva pseudotomentosa Biatt & Halib.	Amarantaceae	Kamheda	Herb
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	Kehm bal	Tree
Mangifera indica Linn.	Anacardiaceae	Amb	Tree
Carissa congesta Wt.	Apocynaceae	Karaunda	Shrub
Carissa opaca Stapf.	Apocynaceae	Garna	Shrub
Carissa spinarum Linn.	Apocynaceae	Gan	Shrub
Holarrhena antidysenterica (L.) Wall. ex DC.	Apocynaceae	Kurchi, Karchi, Karra, Kora	Tree
Ichnocarpus frutescens Br.	Apocynaceae	Bakar bel	Climber
Nerium indicum Mill.	Apocynaceae	Kaner	Shrub
Vallaris solenacea Ktze.	Apocynaceae	Dudhibel	Climber
Calotropis procera R. Br.	Asclepiadaceae	Desi Ak	Shrub
Ageratum conyzoides Linn.	Asteraceae	Bakari abish, Gumdrya	Herb

Parthenium hysterophorus Linn.	Asteraceae	Congress, Gajar grass	Herb
Xanthium strumarium Linn.	Asteraceae	Chirchitta	Shrub
Bidens bipinnata Linn.	Asteraceae	Kokadi	Herb
Cordia dichotoma Forst. f.	Boraginaceae	Lasura	Tree
Ehretia laevis Roxb.	Boraginaceae	Chamror	Shrub
Opunitia sp.	Cactaceae	Chhitarthor	Shrub
Bauhenia vahlii W. & A.	Caesalpiniaceae	Taur	Climber
Bauhenia variegata Linn.	Caesalpiniaceae	Kachnar	Tree
Bauhinia racemosa Lam.	Caesalpiniaceae	Kali-Kachnar, Ashta, Kosundra	Tree
Cassia fistula Linn.	Caesalpiniaceae	Amaltas	Tree
Cassia occidentalis Linn.	Caesalpiniaceae	Chakunda/Kasaundi	Shrub
Cassia sophera Linn.	Caesalpiniaceae	Kasunder	Shrub
Cassia tora Linn.	Caesalpiniaceae	Ailwan, Chakunda, Panevar	Shrub
Parkinsonia aculeate Linn.	Caesalpiniaceae	Parkinsonia	Tree
Cannabis sativa Linn.	Cannabidaceae	Bhang, Ganja, Charas	Shrub
Capparis sepiaria Linn.	Capparidaceae	Hins	Climber
Crataeva nurvala Buch.-Ham.	Capparidaceae	Parvati Plant	Tree
Crataeva unilocularis Buch.-Ham.	Capparidaceae	Barna	Tree
Celastrus paniculata Willd.	Celastraceae	Malkangni, Sankhiran	Climber
Elaeodendron roxburghii Wt. & Arn.	Celastraceae	Mirgu	Tree
Anogeissus latifolia Wall.	Combretaceae	Chhal	Tree
Terminalia alata Heyne.	Combretaceae	Chila	Tree
Terminalia arjuna Wt. & Arn.	Combretaceae	Arjun	Tree
Terminalia bellirica Roxb.	Combretaceae	Bahera	Tree
Terminalia chebula Retz.	Combretaceae	Harar	Tree
Merremia aegyptia (Linn.) Urban	Convolvulaceae	-	Creeper
Diospyros cordifolia Roxb.	Ebenaceae	Kaindu	Tree
Diospyros tomentosa Roxb.	Ebenaceae	Kinu	Tree
Echinocarpus dasycarpus Benth.	Elaeocarpaceae	Gobra, Gobria	Climber
Emblica officinalis Gtn.	Euphorbiaceae	Anula	Tree
Euphorbia hirta Linn.	Euphorbiaceae	Lal Dudhi	Creeper
Euphorbia royleana Boiss.	Euphorbiaceae	Thor	Shrub
Flueggea virosa Roxb. ex Willd.	Euphorbiaceae	Girthan	Tree
Jatropha curcas Linn.	Euphorbiaceae	Japlita, Jangli arandi	Shrub
Mallotus philippinensis Muell. Arg.	Euphorbiaceae	Kamal	Tree
Putranjiva roxburghii Wall.	Euphorbiaceae	Putajan	Tree
Ricinus communis Linn.	Euphorbiaceae	Arandi	Tree
Flacourtia indica Merr.	Flacourtiaceae	Kangoo, Paniala, Bilangra, Kanju	Tree
Geranium wallichianum D.Don	Geraniaceae	Laljhari, Liljahri	Herb
Colebrookia oppositifolia J. E. Smith	Lamiaceae	-	Shrub
Ocimum basilicum Linn.	Lamiaceae	Bantulsi	Shrub
Perilla frutescens (Linn.) Brittom	Lamiaceae	Bhangira, Jhutela	Herb
Loranthus sp.	Loranthaceae	Banda	Shrub
Woodfordia fruticosa Kurz.	Lythraceae	Dhawin	Shrub
Salmalia malabarica Schott & Endl.	Malvaceae	Semal	Tree
Sida acuta Burm. F.	Malvaceae	Bariara	Herb
Sida cordata Borss.-Waalkes	Malvaceae	Bhiumli	Herb
Sida cordifolia Linn.	Malvaceae	Kharenti	Herb
Sida ovata Forssk.	Malvaceae	Bala	Herb
Abutilon indicum Sw.	Meliaceae	Kanghi, Comb plant.	Shrub
Azadirachta indica Juss.	Meliaceae	Neem, Nim	Tree
Cedrela toona Roxb.	Meliaceae	Tun	Tree
Melia azadirach Linn.	Meliaceae	Drek	Tree
Cissampelos pareira Linn.	Menispermaceae	-	Climber
Tinospora malaberica Miers	Menispermaceae	Giloe	Climber
Albizzia lebbek Benth.	Mimosaceae	Kala siris	Tree
Mimosa himalayana Gamble	Mimosaceae	Durghari	Climber
Acacia catechu Willd.	Mimosaceae	Khair	Tree
Acacia leucophloea (Roxb.) Willd.	Mimosaceae	Reru	Tree
Acacia modesta Willd.	Mimosaceae	Phalahi	Tree
Acacia nilotica (L.) Willd. ex Del.	Mimosaceae	Kikar	Tree
Ficus bengalensis Linn.	Moraceae	Barh, Banayan, Bargad	Tree
Ficus glomerata Roxb.	Moraceae	Gullar	Tree
Ficus palmate Forssk.	Moraceae	Phaguri	Tree
Ficus religiosa Linn.	Moraceae	Pipal	Tree
Moringa oleifera Lamk.	Moringaceae	Sohanjna	Tree
Eucalyptus tereticornis Sm.	Myrtaceae	Safeda	Tree
Syzygium cumini Skeels	Myrtaceae	Jamun	Tree
Nyctanthes arbor-tristis Linn.	Oleaceae	Kuri	Shrub
Oxalis corniculata Linn.	Oxalidaceae	Khatti buti	Herb
Oxalis corymbosa DC	Oxalidaceae	Khatti buti	Herb
Abrus precatorius Linn	Papilionaceae	Rattak	Climber

Butea monosperma (Lamk.) Taub.	Papilionaceae	Dhak, Palas, Palah	Tree
Dalbergia sissoo Roxb.	Papilionaceae	Shisham, Tahli	Tree
Desmodium triflorum DC.	Papilionaceae	Janglimethi	Herb
Indigofera cassiodes Rottl. ex DC.	Papilionaceae	Mothi	Shrub
Millettia auriculata Baker.	Papilionaceae	Ganj	Climber
Mucuna pruriens DC.	Papilionaceae	Grelu	Tree
Ougeinia oojeinensis (Roxb.) Hocht.	Papilionaceae	Sanan	Tree
Pueraria tuberosa DC.	Papilionaceae	Salohar	Climber
Desmodium concinnum DC.	Papilionaceae	Janglimethi	Herb
Rhamnus triquetra Wall.	Rhamnaceae	Gir githan	Shrub
Ziziphus mauritiana Lamk.	Rhamnaceae	Ber	Tree
Ziziphus nummularia (Burm. f.) W. A.	Rhamnaceae	Balah	Shrub
Oroxylum indicum Vent.	Rignoniaceae	Tatpirmga	Tree
Pyrus pashia Buch.-Ham.	Rosaceae	Kainth	Tree
Hymenodictyon excelsum Wall.	Rubiaceae	Banthua	Tree
Mitragyna parvifolia Korth.	Rubiaceae	Kalam	Tree
Wendlandia heynei Sant. & Merch.	Rubiaceae	Pansera	Shrub
Aegle marmelos Correa ex. Roxb.	Rutaceae	Bel, Bael	Tree
Limonia acidissima Linn.	Rutaceae	Bilan	Tree
Murraya exotica Linn.	Rutaceae	Nargan	Shrub
Murraya koengii (Linn.) Spreng	Rutaceae	Mitha neem, Gandhela, Barsanga	Shrub
Salix tetrasperma Roxb.	Salicaceae	Bedmajnu	Tree
Casearia tomentosa Roxb.	Samydaceae	Chilla	Tree
Dodonaea viscosa (Linn.) Jacq.	Sapindaceae	Mendru	Shrub
Euphoria dracunculoides Lam.	Sapindaceae	Chagutputi, Kangi, Richni	Tree
Euphoria helioscopia Linn.	Sapindaceae	Hirruseeah, Mahabi, Chatriwal,	Tree
Euphoria longana Steud.	Sapindaceae	Dudhi	Tree
Madhuca longifolia (Koenig) Macbride	Sapotaceae	Mahwa	Tree
Ailanthes excelsa Roxb.	Simarubaceae	Ullinium	Tree
Helicteres isora Linn.	Sterculiaceae	Maror phali	Shrub
Tamarix dioica Roxb.	Tamaricaceae	Jhau	Shrub
Grewia oppositifolia Roxb.	Tiliaceae	Dhaman	Shrub
Triumfetta rhomboidea Jacq.	Tiliaceae	Chikti	Shrub
Holoptelea integrifolia Planch.	Ulmaceae	Kanju, Khulen Banchilla, Dhamma	Tree
Boehmeria platyphylla D. Don	Urticaceae	Paliara	Tree
Broussonetia papyrifera Vent.	Urticaceae	Paper mulberry	Tree
Moras alba Linn.	Urticaceae	Tut, Mulberry, Moru	Tree
Gmelina arborea Roxb.	Verbenaceae	Gumhar	Tree
Grewia sapinda Roxb.	Verbenaceae	Ban kanak	Shrub
Lantana aculenta Linn.	Verbenaceae	Janglibutti	Shrub
Lantana camara Linn.	Verbenaceae	Panchphuli, Kuri, Chudhyal butti	Shrub
Vitex negunda Linn.	Verbenaceae	Bana	Shrub
Ampelocissus latifolia Planch.	Vitaceae	Gidardakh	Climber
Tribulus terrestris Linn.	Zygophyllaceae	Gokhru	Herb
Pinus roxburghii Roxb.	Pinaceae	Chid	Tree
Commelina benghalensis Linn.	Commelinaceae	Kankowa	Herb
Cyperus esculentus Linn.	Cyperaceae	Kaseru, Dila	Sedge
Cyperus niveus Retz.	Cyperaceae	Motha	Sedge
Dioscorea belophylla Voigt	Dioscoreaceae	Tarar, Batendu	Herb
Dioscorea deltoidea Wall.	Dioscoreaceae	-	Climber
Asparagus racemosus Baker	Liliaceae	Asparagus	Shrub
Smilax parvifolia Wall.	Liliaceae	-	Climber
Phoenix sylvestris Roxb.	Palmae	Jangli khajur	Tree
Alloteropsis cimicina (L.) Stapf	Poaceae	Takri	Grass
Aristida setacea Retz.	Poaceae	Ghian	Grass
Arundinaria falcata Nees	Poaceae	Nara	Grass
Arundo donax Linn.	Poaceae	Nara	Grass
Bambusa arundinacea Willd.	Poaceae	Magar	Grass
Chrysopogon fulvus Choiv.	Poaceae	Dhaulu	Grass
Cymbopogon citratus (DC.) Stapf.	Poaceae	Lemon grass	Grass
Cymbopogon martini (Roxb.) Wats.	Poaceae	Dhub Khabbal, Talla	Grass
Cynodon dactylon Pers.	Poaceae	Khabal, Dhub, Hariali	Grass
Dactyloctenum aegyptium (Linn.) P. Beauv.	Poaceae	Madhana	Grass
Dendrocalamus strictus Bl.	Poaceae	Baans	Grass
Dicanthium annulatum Stapf.	Poaceae	Panni, Ganni	Grass
Digitaria abludens (Roth. & Schult) Veldk.	Poaceae	Bahia grass	Grass
Digitaria bifasciculata auct. non Henr.	Poaceae	Love grass	Grass
Digitaria ciliaris Koel	Poaceae	Kewari, Sheri	Grass
Digitaria longiflora (Retz.) Pers.	Poaceae	Kanka-jariya	Grass
Digitaria stricta Roth. ex Roem. & Schult.	Poaceae	Bent grass	Grass
Erianthus munja (Roxb.) Jeswiet	Poaceae	Kana, Munj	Grass
Eriophorum comosum Wall.	Poaceae	Ghorbaggar	Grass
Eulaliopsis binata Hubbard	Poaceae	Baggar	Grass

Heteropogon contortus (L.) P. Beauv.	Poaceae	Lambu, Sariala, Kans	Grass
Oplismenus burmannii (Retz.) Beauv.	Poaceae	Nini grass	Grass
Oplismenus compositus (Linn.) P. Beauv.	Poaceae	Falva grass	Grass
Poa annua Linn.	Poaceae	Arundi	Grass
Saccharum benghalensis Retz.	Poaceae	Giant fodder grass	Grass
Saccharum spontaneum Linn.	Poaceae	Kahi, Kandali	Grass
Setaria glauca (Linn.) P. Beauv.	Poaceae	Foxtail grass	Grass
Setaria italica (Linn.) P. Beauv.	Poaceae	Italy grass	Grass
Setaria verticillata (Linn.) P. Beauv.	Poaceae	Varuni	Grass
Themeda anathera Hack.	Poaceae	Lunji	Grass

Poaceae was the most dominant family with 30 species and 21 genera. Other main contributing families were Papilionaceae (10 species and 10 genera), Caesalpiniaceae (8 species and 3 genera), Euphorbeaceae (8 species and 7 genera), Apocynaceae (7 species and 5 genera), Acanthaceae (6 species and 4 genera) and Mimosaceae (6 species and 3 genera). Twenty-five families (23 dicots and 2 monocots) had only one species each (Table 2).

Sharma [9] recorded 1879 species of angiosperms from Punjab whereas Sharma *et al*. [10] recorded 526 species and Manhas *et al*. [11] recorded 202 species of angiosperms in their studies on Shiwaliks of Punjab. The dominance of plants from Poaceae, Euphorbiaceae and Apocynaceae families in the study site supports the harsh environmental conditions especially the water stress, because these plants have made morphological, anatomical and physiological modifications to overcome the drought conditions [12]. Dominance of Papilionaceae shows that these areas are nutrient deficient especially nitrogen [11,12].

Table 2. List of important families of the study area

Family	Species	Genera
Dicotyledons		
Papilionaceae	10	10
Caesalpiniaceae	8	3
Euphorbiaceae	8	7
Apocynaceae	7	5
Acanthaceae	6	4
Mimosaceae	6	3
Combretaceae	5	2
Malvaceae	5	2
Verbenaceae	5	4
Amarantaceae	4	2
Asteraceae	4	4
Meliaceae	4	4
Moraceae	4	1
Rutaceae	4	3
Sapindaceae	4	2
Capparidaceae	3	2
Lamiaceae	3	3
Rhamnaceae	3	2
Rubiaceae	3	3
Urticaceae	3	3
Anacardiaceae	2	2
Boraginaceae	2	2
Celastraceae	2	2
Ebenaceae	2	1
Menispermaceae	2	2
Myrtaceae	2	2
Oxalidaceae	2	1
Tiliaceae	2	2
Other (25)	1	1
Monocotyledons		
Poaceae	30	21
Dioscoreaceae	2	1
Liliaceae	2	1
Palmae	2	2
Commelinaceae	1	1
Cyperaceae	1	1
Gymnosperms		
Pinaceae	1	1

The diversity of life forms was higher in the present study site (Figure 2). The most dominant life form was trees (36.9%) followed by shrubs (22.7%), grasses (17.1%), herbs (13.6%), climber (8.5%) and sedges (1.1%).

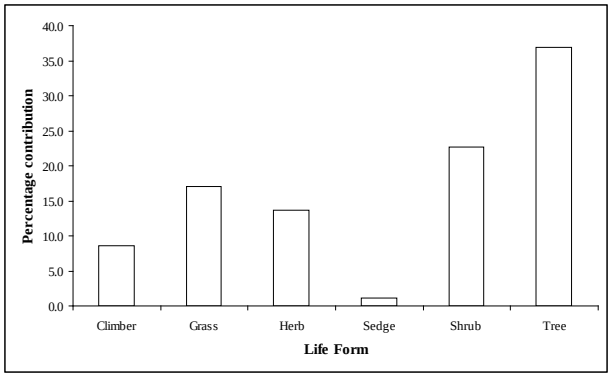

Figure 2. Contribution of various life forms to the flora of Hoshiarpur, Punjab

Generally, the high diversity of trees is associated with undisturbed tropical forests. But, forest sites in Punjab are highly degraded, which is also supported by the high shrub richness and dominance of grasses. Both these life forms prefer open forests with wide canopy gaps. High tree diversity of the present study may be ascribed to some of the protected areas (farm houses) of Hoshiarpur.

The vegetation of Kandi region of Punjab is very precious for the economy of the locals [13]. It provides fodder, fuelwood, non-wood forest products, medicinal plants etc. But, to use these natural resources in a sustainable way should be the main priority of the State Government and State Forest Department. Plantation programs and protection of vegetation from fire and grazing in different parts of Kandi belt are some of the initiatives taken by the forest department. In some parts of Kandi region joint forest management (JFM) has also been started with the help of locals.

Kandi region is a hilly terrain and major portion of the rainfall flows down without any underground water recharge due to lack of vegetation, as a result of this the entire Kandi region experiences drought like conditions in summer [14]. Various programs launched by the Punjab State Government and Department of Soil and Water Conservation, Punjab to build small check dams to collect water as well as slow down its flow during rainy season will certainly help the local vegetation. Water harvesting may be the other option of recharging the ground water [15].

4. Conclusion

The present study deals with the floristic diversity of Kandi region of Hoshiarpur, Punjab. The plants were collected and then pressed in old newspapers/blotters. The

pressing of plant specimens was carried out. The dried specimens were mounted on the herbarium sheets. Herbarium sheets were protected against damage from insects by poisoning them with 1% mercuric chloride. Naphthalene balls were also used to keep the insects away from the Herbarium. The floristic listing of species is very important for researchers and forest managers, as it tells us about the available resources of a region. This information can be utilized in future planning of sustainable utilization of these resources. Time to time assessment of species diversity also helps in studying the impact of temporal changes vis a vis change in land-use pattern, climate change etc.

References

[1] Shardha, Y. P. and Bagchi, J., An approach to meet the challenge of unpredictable hydrology in small catchments with reference to Kandi watershed area, Punjab, in National Symposium: Role of Earth Sciences in Integrated Development and Related Societal Issues, 2-4 November 2001, Lucknow. Special Publication No. 65: Vol. II. Kolkata. *Geological Survey of India*, 2001, 242 p.

[2] Champion, H.G. and Seth, S.K., *A revised classification of the Forest Types in India*. Manager Publications, GOI, New Delhi, 1968, 105-15.

[3] Stewart, J.L., *Punjab Plants Comprising Botanical and Vernacular Name and Uses*. 1869.

[4] Atchinson, J.E.T., *A Catalogue of the Plants of the Punjab and Sindh*. London, 1868.

[5] Bamber, C.J., *Plants of the Punjab. A Descriiptive Key of the Flora of the Punjab, North-West Frontier Province and Kashmir*. London, 1916.

[6] Parker, R.N., *Forest Flora for the Punjab and Hazara and Delhi*. London, 1918.

[7] Nair, N.C., Plants of record for the Punjab Plain. *Bull. Bot. Surv. India*, 21(1). 1-450. 1978.

[8] Sharma, M.L. and Khosla, P.K., *The Grasses of Punjab and Chandigarh*. Punjab University, Chandigarh, 1989, 1-296.

[9] Sharma M., *Punjab Plants-Check List*. Bishen Singh Mahinder Pal Singh, Dehradun, India, 1990.

[10] Sharma, M.L., Jerath, N. and Chadha, J., Angiosperms Biodiversity in the Shiwalik Ecosystem of Punjab. Punjab Science and Technology Department, Chandigarh, 256-450.

[11] Manhas, R.K., Singh, L. Vasistha, H.B. and Negi, M., Floristic Diversity of Protected Ecosystems of Kandi Region of Punjab, India. *New York Science Journal*, 3 (4). 96-103. 2010.

[12] Vasistha, H.B., Manhas, R.K., Singh, L., Negi, M. and Sharma, J. Impact of Disturbances on Biodiversity Status, Resource Availability and their Management for Sustainable Development in Kandi Area of Punjab. Punjab Forest Department, Chandigarh.

[13] Sarlach, R.S., Bhushan, B., Sharma, S.C., and Aulakh, P.S., Scope of raising aromatic, medicinal and spice crops in Kandi area of Punjab. *International Journal of Forest Usufructs Management*, 1(7). 49-53. Jul. 2006.

[14] Sheoran, P., Singh, S., Sidhu, B.S., Sardana, V., and Aulakh, P.S., Analysis of drought, dry and wet spells in Kandi region of Punjab. *Journal of Research*, 43(1). 14-16. Jan. 2006.

[15] Rana, D.S., Bawa, S.S., Singh, S. and Aulakh, P.S., Water harvesting, available technique for the rain-fed agro-ecosystem in foothill Shiwaliks of Punjab. Proceeding on *"Efficient Water management for eco-friendly, sustainable and profitable agriculture"* held at IARI, New Delhi, 2005, 153-154.