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Plant Biodiversity of Central University of Punjab Main Campus



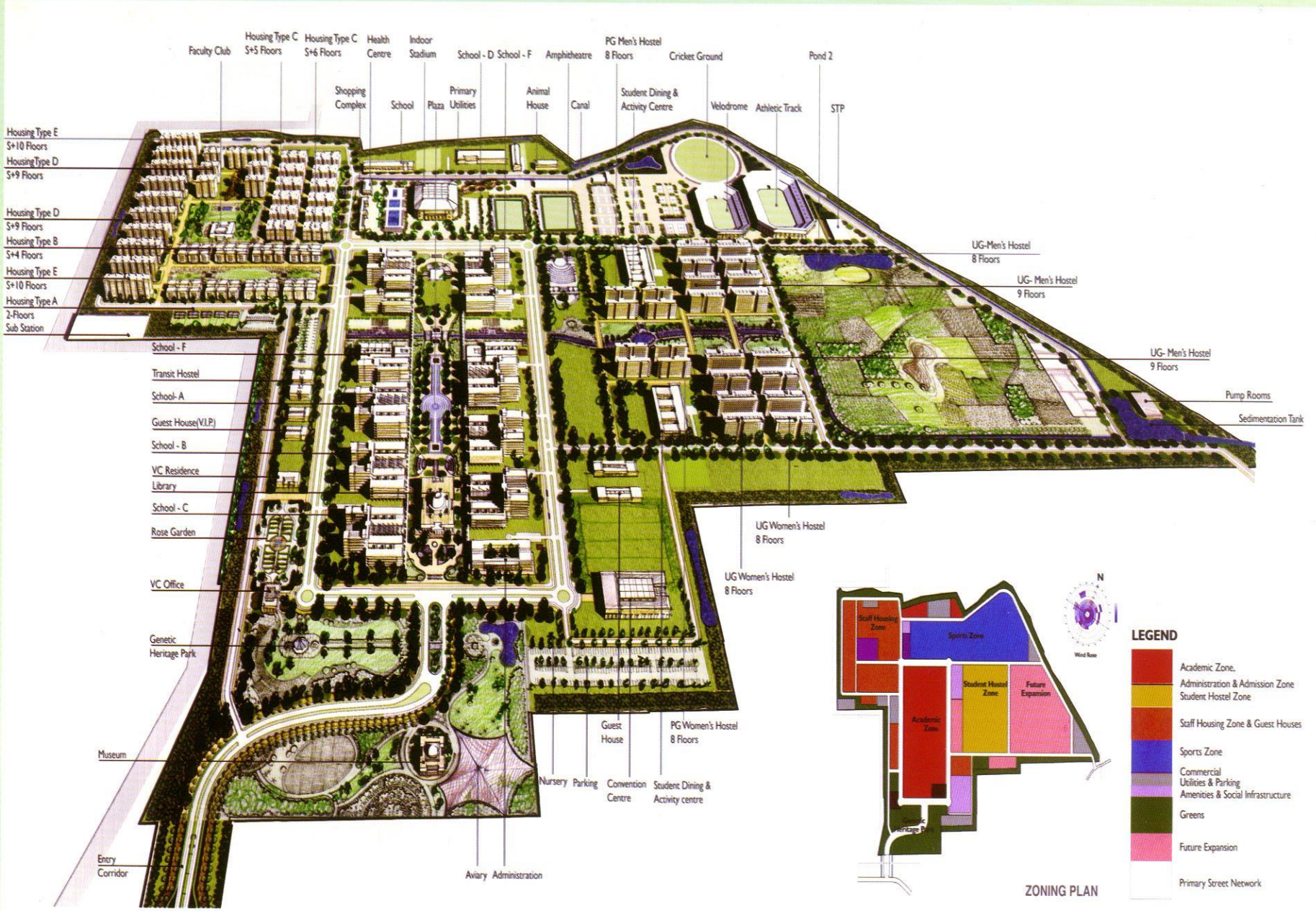

February 2014

Central University of Punjab, Bathinda

(Established vide an Act of Parliament in 2009)

Central University of Punjab

Master Plan of the Main Campus



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Message of the Vice Chancellor

Biodiversity is the most important natural resource for the survival of living organisms including humans. Ever increasing human interference with nature through unsustainable development threatens biodiversity which is a matter of global concern. The problem is particularly grave in semi-arid and arid regions where natural regeneration of plants is very slow due to limiting rainfall and extreme weather conditions. Depletion of plant biodiversity in such fragile ecosystems may be an irreversible loss.

Several attempts have been made to study the flora of pre-partition Punjab, but the accounts available so far are too sketchy for want of technology and reorganisations of the state of Punjab.

The Central University of Punjab established in 2009 has been functioning so far from its City Campus located on the outskirts of Bathinda city. Very soon, construction work to build the main campus on a 500 acre site 25 km away from the present campus will commence. This site has been lying uninhabited and without any agricultural activity since its allocation to the university five years before; providing opportunities to the flora to grow unhindered under natural habitat. It is feared that with the commencement of construction activity some species will disappear never to be spotted again.

The university is commited to preserve all the inhabiting plant species. Therefore, the Centre for Biosciences of the university has endeavoured to carry out a botanical survey of the site to document and conserve all the available flora. Based on this, a publication reporting 157 species from the site has been prepared. At least two of the species identified from the site namely, *Ephedra foliata* and *Tecomella undulata* are in the Red List of IUCN. The seeds, propagules and dried samples of all the species identified have been preserved in the university herbarium. This publication will provide a useful account of the flora of Bathinda region which is so far incomplete. I congratulate the faculty of the Centre for Biosciences for their efforts and achievement. I hope the information gathered from this study would be of immense use in understanding the plant biodiversity patterns and for conservation management of this region.

Prof. Dr. Jai Rup Singh
Vice Chancellor

Plant Biodiversity at Central University of Punjab

The Central University of Punjab created by an act of Parliament has been functioning from a transit campus called "City Campus" since its establishment in 2009, just 5 km away from the main bus terminal of Bathinda City. The 500 acre site where the main campus of the university will come up shortly is located 22 km away from Bathinda City in the country side on Bathinda-Badal road (N 30° 08′ 5.02″; E 74° 48′ 2.46″). Bathinda district situated in the Satluj-Ganga plain of Malwa region is the gateway to Thar desert, the main stretch of which lies in Rajasthan. It is a low-lying flat area of 3,36,725 hectares at an altitude of 220 m above sea level. The climate is semi-arid with a very hot summer season (April-June), a mild rainy season (July-September) and a dry and cold winter season (November-February). The dust storms often strike in summer season when temperature sours to above 48°C in May and June. Nights are cool and pleasant owing to its vicinity to the Thar desert. The average annual rainfall is 410 mm. In winter season, the temperature drops to freezing point in December and January.

The university site which had primarily supported cultivation of crops like rice, wheat, cotton, dry land fodders and vegetables had been lying vacant since its allotment to the university by the Government of Punjab in 2009. Consequently, it provided opportunity for wild plants to grow in abundance and represent the natural flora of the area. It is likely that whatever species were not able to grow due to competition from crop plants earlier, had ample opportunity to grow unhindered and the campus site now represents the true plant biodiversity of the area.

Originally the vegetation of the district was thorny deciduous and xerophytic type (Gazetteer 1992). Shisham *(Dalbergia sissoo),* Kikar/babul *(Acacia nilotica),* Ber *(Ziziphus mauritiana),* Neem *(Azadirachta indica), Jand (Prosopis cineraria)* were the principal constituents of the original woody vegetation. There was abundant presence of species like Pipal *(Ficus religiosa),* Bohar *(Ficus bengalensis),* Van *(Salvadora oleoides),* Siris *(Albizzia lebbeck)* and Reru *(Acacia leucophloea).* The undergrowth consists of Mallah *(Ziziphus nummularia,* Ak *(Calotropis procera),* Hins *(Capparis sepiaria),* Khair *(Capparis decidua).* Ground flora consisted of considerably large number of grasses, herbs and sedges. The moist and low lying areas had dense growth of Kana *(Saccharum bengalense)* and kahi *(Saccharum spontaneum).* On waterlogged sites Bater *(Typha elephantiana)* occurs densely. In unfavorable and moderately grazed areas, Khabbal *(Cynodon dactylon)* is found growing. The other grasses met with are Anjan *(Cenchrus spp.)* on sandy places, Dab *(Demostachya bipnnata) in* dry places, *Aristida* spp. on saline soil and sariala *(Heteropogon contortus)* on heavily grazed areas. *Cyperus* species are found in small patches in marshy areas (Gazetteer 1992).

Due to the introduction of assured irrigation by canal system, some exotics were introduced by the Forest Department in the district. These exotics are Mysore gum (*Eucalpyptus hybrida and* Walaiti Jand *(Prosopis juliflora*). Recently, some more promising exotics have been introduced like Sagwan (*Tectona grandis) Casuarina equisetifolia, Ailanthus excelsa* and Su-babul *(Leucaena leucocephala).* Many exotic species have also been introduced such as *Lantana camara, Xanthium indica, Parthenium hysterophorus* and *Cassia obtusifolia* due to human activities.

Although the university has commitment to preserve the flora and fauna of the site, still some natural flora may be lost after the site is inhabited by nearly 20,000 students and supporting staff of the university and a lot of anthropogenic activity in the years to come. Therefore, an initiative has been taken to record all presently available plant biodiversity at the site where main campus of the university will come up.

Prof. R. G. Saini
Coordinator, Centre for Biosciences

Description of the main campus site

The main campus covers an area of 500 acres and a small drain carrying water from canal passes through it which creates moist soil conditions in the abandoned fields. A small grove of *Salvadora oleoides, Ephedra foliata and Zizyphus mauritiana* is present very close to the north-western boundary wall. Most of the area was under cultivation of wheat and rice crops until 2009 after which it was acquired by the Central University of Punjab for development of main campus. It has been under protection since then from anthropogenic disturbances but it has been subjected to partial grazing by a herd of about 20 cows which are the natural inhabitants of this area. The site has developed in to a savannah community during the last nearly five years.

Botanical survey of the site was carried out from May 2013 to December 2013 to record and collect the specimens of different plant species present at the campus site. The plant specimens have been deposited in the Central University of Punjab herbarium. The photographs of plants have been taken in natural conditions. The distribution and population density of various plant species was evaluated by quadrat method in October and November 2013. The site was divided into six study zones of almost equal size and uniform edaphic conditions (Fig.1, Plates 1-6). The density and frequency of woody and perennial herbs was estimated by laying 10 quadrats of 100 m^{-2} size each and of annual herbaceous species by laying 20 quadrats of 1 m^{-2} size each at random in every study zone.

Plate 1. Grass vegetation on a sand dune in the study zone 1 in southern part of the main campus site.

Plate 2. Scrub type vegetation in the study zone 2 at the end of sand dune in southern part of the main campus site.

Plate 3. Scrub type vegetation in the study zone 3 towards the eastern side in the middle of the main campus site.

Plate 4. Grass vegetation with halophytes in the study zone 4 in saline soil in north-eastern part of the main campus site.

Plate 5. A forest patch and savannah in the study zone 5 in north-western part of the main campus site.

Plate 6. A savannah community in the study zone 6 on western side in the middle of the main campus site .

The vegetation of the main campus is savannah type desert community. A savannah community consists of a continuous layer of graminoids (grasses and sedges) and a discontinuous layer of trees and shrubs. It has been suggested that savannah-woodlands are a degraded stage of primary deciduous forest in Indian sub-continent as no naturally occurring savanah ecosystems are present (Gadgil and Meher-Homji 1985).

On the sand dunes *Cenchrus biflorus* and *Cenchrus ciliaris* dominate the vegetation with scattered small trees of *Azadirachta indica* and *Dalbergia sissoo* and a small plantation of *Ziziphus jujuba*. The abandoned fields in the middle part of the campus site are dominated by *Prosopis chilensis* along with *Cynodon dactylon, Cenchrus biflorus* and *Cenchrus ciliaris* as herbaceous vegetation. The wasteland with saline soil towards the north-east part of campus site is dominated by *Kochia indica, Calotropis procera, Aerva pseudotomentosa, Panicum antidotale, Cenchrus biflorus, Cenchrus ciliaris, Parthenium hysterophorus* with scattered small trees of *Prosopis chilwnsis, Acacia nilotica, Acacia tortilis,* and *Azadirachta indica*. The other plant species scattered throughout the campus site in good numbers are *Solanum surattense, Ipomoea pes-tigridis, Ipomoea aquatica,*

Ipomoea sindica, Merremia aegyptia, Xanthium strumarium, Artemisia scoparia, Datura stramonium, Aerva persica, Abutilon indicum, Chenopodium ambrosoides, Momordica balsamina, Cucumis melo var. *agrestis, Tribulus terrestris, Indigofera sessiliflora, Cocculus pendulus, Saccharum bengalense, Cyperus rotundus, Echinochloa colonum* and *Digitaria ciliaris.* Besides these species, some rare plant species are also present which are represented by only a few individuals in the main campus site. These are *Ephedra foliata, Leptadenia pyrotechnica, Farsetia hamiltonii, Ipomoea eriocarpa, Salvadora oleoides, Tecomella undulata, Lasiurus sindicus, Cymbopogon jwarancusa* and *Withania sominifera. Tecomella undulata* with about six trees and *Ephedra foliata* which grows in association with *Salvadora oleoides* in small groves are in the red list of UNDP 2008.

There are 24 woody species at the main campus site out of which only 17 species were present in the sample quadrats laid in different study zones of the campus site of the Central University of Punjab (for density and frequency of these species please see Appendix I). The campus site has 134 herbaceous species. The grass and *Cyperus* species have the highest density (For details please see Appendix II).

It appears that during the five year period (2009-2013) of possession of the site about 120 woody and herbaceous indigenous species have been established in high population density in different parts of the main campus site indicating that in the partially protected areas like this site, there is a potential for the natural communities to develop within a short period.

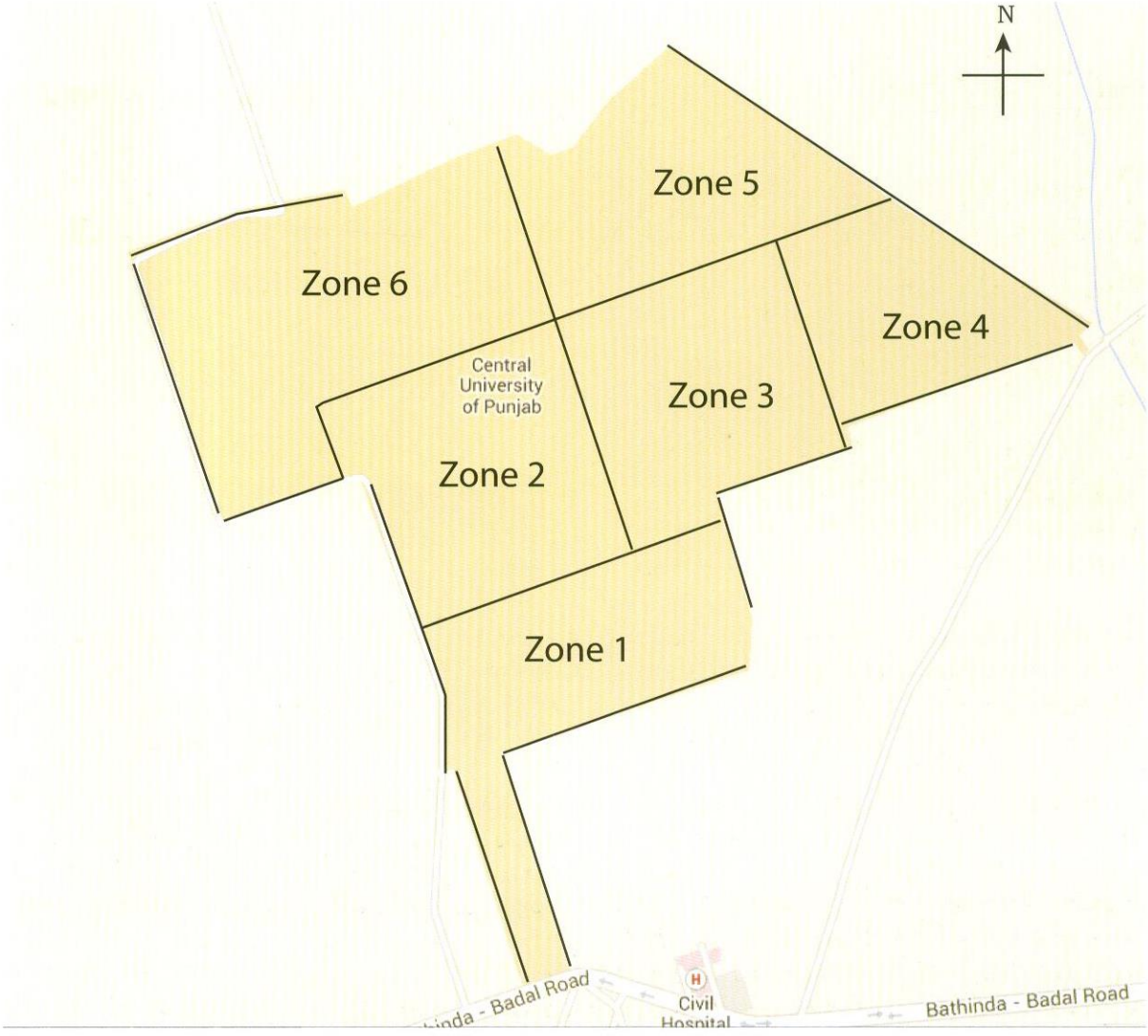


Figure 1. Map of the main campus of the Central University of Punjab showing location of the study zones.

Enumeration of plant species

There are 158 plant species that were identified from the main campus site of the Central University of Punjab in 2013. *Equisetum ramosissimum* and *Adiantum capillus-veneris* belonging to the pteridophyta and a gymnosperm *Ephedra foliata* were also identified (Table 1). Of the remaining 154 species, 122 are dicotyledonous species belonging to 90 genera and 41 families, the 33 monocotyledonous species belong to 21 genera and 4 families. In dicots, the largest family is Asteraceae with 15 species followed by Euphorbiaceae with 9 species and Fabaceae and Convolvulaceae with 8 species each. Among the monocots, Poaceae is the largest family having 27 species. Most of the genera have only a few species except Euphorbia and Ipomoea with 6 species each and Heliotropium comprises of 5 species. Brief information about the habitat and economic importance of each of the species identified from the site is in the following pages.

Table 1. The number of species, genera and families recorded from the main campus site of the Central University of Punjab.

Plant groups	Families	Genus	Species
Pteridophytes	2	2	2
Gymnosperms	1	1	1
Dicotyledons	41	90	122
Monocotyledons	4	21	32
Total	**48**	**114**	**157**

Equisetum ramosissimum Desf.

Vernacular name: Horse tails.

Family: Equisetaceae

Habit: Perenial herb.

Habitat: Grows in moist places, dry ponds and along water channels and canals.

Economic importance: High silica content provides it a rough abrasive texture useful in scouring of cooking pots. The crude and purified polysaccharides from it showed stronger free radical scavenging activity and potent inhibitory effect against lipid oxidation, but both polysaccharide samples had weaker oxidant effect than vitamin C (Zhang *et. al.* 2013). However, it may be poisonous and repellent.

Adiantum capillus-veneris L.

Vernacular name: Fern.

Family: Pteridaceae

Habit: Perenial herb.

Habitat: Grows in moist places along water channels and canals.

Economic importance: It is the main ingredient of a popular cough syrup called 'Capillaire', which remained in use until the nineteenth century (Sturat 1979). The various solvent extracts from leaves exhibit biological activities such as antibacterial, antiviral, antifertility, anti-implantation, hypoglycaemic, antioxidant (Ansari and Ekhlasi-Kazaj 2012).

Ephedra foliata Boiss. & Kotschy ex Boiss.

Vernacular name: Suo-Phogro.

Family: Ephedraceae

Habit: Perenial, straggling, woody shrub.

Habitat: Grows in sand in association with Salvadora.

Economic importance: It is grazed by camels in Saudi Arabia. The crushed boiled plant is used for tanning (Norton *et.al.* 2009).

Cocculus pendulus (J.R.&G.Forst.) Diels

Vernacular name: Jal-jamni.

Family: Menispermaceae

Habit: Perenial, twining, woody shrub.

Habitat: Grows in semi-arid and arid regions in sandy soils.

Economic importance: In traditional medicine system, its roots are used for the treatment of intermittent fever and as a tonic. Hypotensive and anticancer activity has been attributed to the

alkaloid fractions from leaves and stem. The leaf juice contains mucilage which when mixed with water forms a jelly which is taken as cooling medicine for gonorrhoea (Chopra *et. al.* 1958).The roots and leaves are used in rheumatic pain (Thakur 1926). It contains phytosterols, proteins and mucilage in the leaf extract (Rabari *et. al.* 2010).

Argemone mexicana Linn.

Vernacular name: Satayanasi.

Family: Papaveraceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and waste lands in this region.

Economic importance: It is a common weed of winter season. *Brassica campestris* seeds are adultrated with its seeds. The oil obtained from adulterated seeds is very harmful for human eyes. In traditional medicine, the whole plant is used for treatment of tumors, warts, skin diseases, inflammations, rheumatism, jaundice, leprosy, piles, worm infection and dysentry (Priya and Rao 2012). Seeds are narcotic, stronger than opium, and possesses emetic property (Mukhopadhyay and Ghosh 1993).

Farsetia hamitonii Royle

Vernacular name: Bui.

Family: Brassicaceae

Habit: Annual herb.

Habitat: Grows on sand dunes in arid regions.

Economic importance: It is a good fodder for animals of the desert. It is used for the treatment of rheumatism and also taken as a cooling medicine after pounding. Leaves are aromatic and carminative. Fruits are astringent, stomachic and stimulant. The pulp of this plant is applied externally for the remedy of stings of venomous insects.

Fumaria parviflora Lam.

Vernacular name: Papra.

Family: Fumariaceae

Habit: Annual herb.

Habitat: Grows in moist soils in winter season.

Economic importance: It is used traditionally in dermatological diseases, in stimulation of liver function and gall bladder and also as diuretic, expectorant, antipyretic, diaphoretic, appetizer and laxative (Gilani *et. al.* 2005). Its extract may be considered for treatment of chronic hand eczema (Jowkar *et. al.* 2011). It has significant hypoglycaemic effect on STZ-induced diabetic rats (Fathiazad *et. al.* 2013)

Capparis decidua (Forssk.) Edgew.

Vernacular name: Kair.

Family: Capparidaceae

Habit: Thorny shrub or a small tree.

Habitat: Grows in rocks, gravel and sady soil in semi-arid and arid regions.

Economic importance: Its mature fruits are eaten and imature fruits are used as vegetable. In Ayurveda, the bark is used as analgesic, diaphoretic, laxative, in dropsy, anthelmintic, and good in asthma, ulcers, boils, vomiting, piles and in all inflammations. The fruit is astringent, used for urinary problems and good for cardiac problems. The roots are pungent and given in fever, asthma, inflammations and rheumatism Chopra *(et. al.* 2006; Gupta 2010).

Cleome viscosa linn.

Vernacular name: Bagro; Hulhul.

Family: Capparidaceae

Habit: Erect, viscid, annual or perennial herb.

Habitat: Grows in waste lands, abandoned fields and along roadsides throughout the country.

Economic importance: Its seeds are used as condiments. Its leaves and young shoots are used to cook like a vegetable which have sharp mustard

like flavour. The pungent seeds and fruits can be used as a mustard substitute in curries (Cornucopia 1990; Manandhar 2002). Bawankule *et. al.* (2008) reported that the coumarinolignoids from *Cleome viscosa* inhibited the pro-inflammatory mediators and enhanced the production of anti-inflammatory mediator in female Swiss albino mice. The juice of the plant diluted with water is given in fever and the leaves are useful in healing wounds and ulcers (Kirtikar and Basu 1975).

Portulaca oleracea Linn.

Vernacular name: Luni.

Family: Portulacaceae

Habit: Annual herb.

Habitat: Grows in sandy, saline, and moist soils.

Economic importance: Its leaves are eaten by human beings. It contains more omega-2 fatty acids than any other leafy vegetation. It is used for treatment of boils, sores, pain from bee stings, bacillary dysentry, diarrhoea and intestinal bleeding. It is also used to cure insect and snake bites.

Abutilon indicum (Linn.) Sweet

Vernacular name: Tara-kanchi, Kanghi.

Family: Malvaceae

Habit: Perennial herb or shrub.

Habitat: Grows in waste lands in this region.

Economic importance: Stem bark yield fibres used for making ropes and cords. Powder of bark, leaf, flower, fruit and root is used to cure giddiness. It has been used as anthelmintic, anti-inflammatory, in urine and uterine discharge and piles. It is used for treatment of fever, dry cough, bronchitis, gonorrhoea and leprosy. It possesses hepatprotective, wound healing, immunomodulatory, analgesic, antimalarial and hypoglycemic activities (Mohite *et. al.* 2012).

Malvastrum coromandelianum (L.) Garcke

Vernacular name: Kharenti.

Family: Malvaceae

Habit: Perennial, erect, stout herb.

Habitat: Grows in wastelands and on roadsides.

Economic importance: Stem bark yield fibres used for making ropes and cords. It exhibited antibacterial and antifungal activity against many bacteria and fungi (Islam *et. al.* 2007-2010). It is used in traditional medicine as an anti-inflammatory, analgesic and anti-dysenteric plant (Fyson 1974). Various extracts of the aerial parts of it showed antinociceptive activity (Reddy *et. al.* 2001). It has beneficial effects on blood glucose level as well as improving hyperlipidemia due to diabetes (Deore *et. al.* 2012).

Sida acuta Burm.f.

Vernacular name: Bal.

Family: Malvaceae

Habit: Much branched under shrub.

Habitat: Grows in abandoned fields.

Economic importance: Stem provides fibres for making ropes and cords and branches are used for making brooms. It is used as a stomachic, diaphoretic and antipyretic. It is regarded as cooling, astringent, tonic and useful in treatment of nervous and urinary diseases and disorders of blood, bile and liver (Khare *et. al.* 2002).

Sida cordifolia Linn.

Vernacular name: Bal.

Family: Malvaceae

Habit: Erect, perennial undershrub.

Habitat: Grows in abandoned fields and waste lands.

Economic importance: Its bark is considered as cooling. It is useful in blood, throat, urine related troubles, piles, phthisis and insanity (Vigar 1984). The roots are astringent, diuretic and a tonic. Pawa *et. al.* (2011) reported that it possesses antioxidant and anthelmintic activity.

Sida ovata Forssk.

Vernacular name: Kharenti.

Family: Malvaceae

Habit: Much branched perennial shrub.

Habitat: Grows in abandoned fields.

Economic importance: Stem provides fibres for making ropes and cords and the plant is used for making brooms. It is grazed by donkeys, sheep and goats. The roots are considered adaptogenic, immunomodulator, general nutritive tonic and prolong life, useful in tuberculosis, heart diseases, cough and respiratory diseases (Kirtikar and Basu 1981).

Urena lobata Linn.

Vernacular name: Van-bhindi.

Family: Malvaceae

Habit: Erect, annual undershrub.

Habitat: Grows in abandoned fields, in moist soils.

Economic importance: Stem bark yields a good quality, easily extractable fibres which are used for manufacturing sacks and twine (Kulkarni and Kumbojkar 1993). In traditional medicine, it is used to cure colic, diarrhoea, skin diseases, boils, pneumonia, rheumatism, cough and diabetes (Mazumader *et. al.* 2001; Pinto *et. al.* 2005). It is reported to possess antidiarrhoeal properties (Yadav and Tangpu 2007).

Corchorus aestuans Linn.

Vernacular name: Kagla ki roti.

Family: Tiliaceae

Habit: Annual herb.

Habitat: Grows in moist shady places and gardens.

Economic importance: The whole plant is grazed by animals. Its leaves are used as vegetable. Stem bark yields fibres used for making cots, mats and thatching.

Corchorus fascicularis Lamk.

Vernacular name: Kagla ki roti.

Family: Tiliaceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and gardens.

Economic importance: The leaves are eaten by human beings. Leaves are rich in trace elements (Nemba *et. al.* 2012).

Corchorus olitorius Linn.

Vernacular name: Kagla-ki-roti.

Family: Tiliaceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and gardens.

Economic importance: It is a fibrous crop. Fibres obtained from it are used for making sacks and ropes. It also has medicinal value as it is reported to be demulcent, diuretic, lactagogue, purgative and tonic (Duke and Wain 1981).

Corchorus tridens Linn.

Vernacular name: Kagnasha.

Family: Tiliaceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and gardens.

Economic importance: It is used as fodder and leaves are used as vegetable also. Leaves are made to slimy sauce. Dried leaves are marketable.

Fagonia indica Brum. f.

Vernacular name: Dhamsa.

Family: Zygophyllaceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and waste lands in semi-arid and arid regions.

Economic importance: It is called a rolling plant which help in checking soil erosion by wind. It is used as herbal tea in some countries. It can kill cancerous cells without affecting normal cells. According to Lam *et. al.* (2012) *Fagonia indica* contains anticancer agent against breast cancer cell proliferation via DNA damage induced FOXO3a and p53 expression.

Tribulus terrestris linn.

Vernacular name: Gokhru.

Family: Zygophyllaceae

Habit: Annual or perenial, prostrate herb.

Habitat: Grows in waste lands in sandy soils.

Economic importance: Fruits, leaves and roots of this plant are of medicinal value. It is used for kidney stone, painful urination, a kidney disorder called Bright's disese. It is aphrodisiac, and also used in chest pain, high blood pressure, high cholesterol and anaemia, digestive disorders, stomatitis, sore throat and cancer especially for nose tumor.

Oxalis corniculata Linn.

Vernacular name: Khatari.

Family: Oxalidaceae

Habit: Annual herb.

Habitat: Grows in abandoned fields and gardens.

Economic importance: It is also known as khati-buti as its leaves are of sour taste and edible.The juice of leaves is used to clean rusted vessels. A drink can be made by infusing leaves in hot water, sweetening and then cooling. The whole plant contains large amount of vitamin C and used in treating scurvy. It is also used in diarrhoea, gastric problems and dysentry.

Citrus aurantium Linn.

Vernacular name: Keno.

Family: Rutaceae

Habit: Shrub.

Habitat: Cultivated in orchards.

Economic importance: The fruit juice is rich in vitamin C and minerals. Tangerine, an essential oil is extracted from it which is good for healthy skin. The oil is antiseptic, antispasmodic, cytophlactic, depurative, sedative, stomachic and a tonic.

Azadiracta indica A. Juss.

Vernacular name: Neem.

Family: Meliaceae

Habit: Tree.

Habitat: Grows in sandy soils in semi-arid and arid regions.

Economic importance: All the parts of the plant are of medicinal value. The air surrounding the canopy is also considered good for health. The extract of leaves is used for skin infections. The leaves are also beneficial for diabetic patients. The leaves and bark of stem are antiallergic, antiseptic, antifeedant, antifungal, anti-inflammatry, antiscabic, diuretic, insecticidal, larvicidal, nematicidal, spermaticidal and many other biological activities. The wood is also used as timber.

Melia azedarach Linn.

Vernacular name: Bakain.

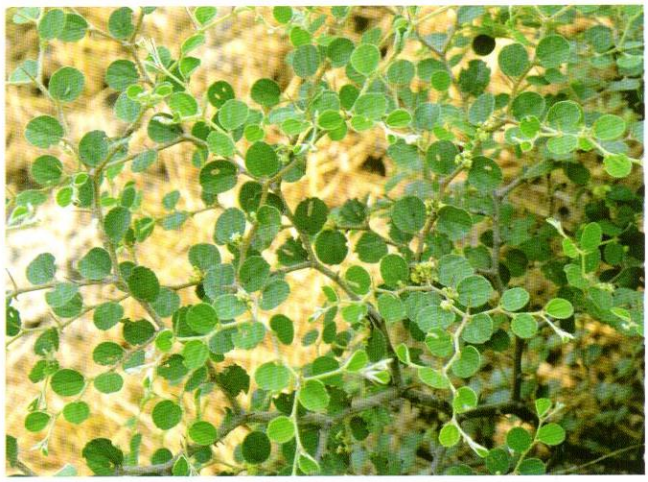
Family: Meliaceae

Habit: Tree.

Habitat: Grown in gardens and along roadsides as an ornamental tree.

Economic importance: It is grown as an avenue tree because of dense shade and beautiful flowers. The wood is of medium density, is used as timber for furniture and other purposes. Its bitter fruits are toxic to human beings if taken in excess quantity.

Ziziphus nummularia (Burm. F.) Wt. & Arn.



Vernacular name: Ber, Malya.

Family: Rhamnaceae

Habit: Small tree.

Habitat: Grows in sandy soils in semi-arid and arid regions.

Economic importance: The plant is of great use in rural areas. Its fresh or dried leaves provide a nutrient rich fodder for cattle. The dry branches are used for making hedges in fields and houses. It is also used as fire wood. The fruits are nutritious and edible, laxative and astringent. Leaves are used as expectorant (Ullah *et. al.* 2010). It is used for treatment of gout, rheumatism, diarrhoea, fever, ulcers, absciss, boils and wounds (Parveen *et. al.* 2007). It is blood purifier and used against vomiting.

Ziziphus mauritiana Lamk.

Vernacular name: Ber, Bordo, Malya.

Family: Rhamnaceae

Habit: Shrub.

Habitat: Grows in sandy soils in semi-arid and arid regions.

Economic importance: Its fruits are edible. They contain alkaloids, flavonoids, terpinoids, saponins, pectins, lipids. It exhibit haemolytic, sedative, anxioltic and sweetness inhibiting properties.

Ziziphus Jujuba Mill.

Vernacular name: Ber.

Family: Rhamnaceae

Habit: Small tree.

Habitat: Grows in sandy soils in semi-arid and arid regions.

Economic importance: The fruits of this plant are highly ntritious and edible and are called apple of the desert.

Ziziphus xylopyrus Willd.

Vernacular name: Ber

Family: Rhamnaceae

Habit: Small tree.

Habitat: Grows in sandy soils in semi-arid and arid regions.

Economic importance: Its fruits are not edible. However, the stem bark is used in diarrhoea, chest pain, as an analgesic, anti-inflammatory and in healing of wounds in folk medicine.

Crotalaria burhia Buch.-Ham.

Vernacular name: Shinio.

Family: Fabaceae

Habit: Perennial, undershrub.

Habitat: Grows on sand dunes in arid regions.

Economic importance: It is used in treatment of gout, hydrphobia, and swelling (Kirtikar and Basu 1975). The branches and leaves are cooling medicine. The occurrence of monocrotaline, an anticancer agent in this species is impotant (Aloskar *et. al.* 1992).

Crotalaria medicaginea Lamk.

Vernacularname: Jhojhroo.

Family: Fabaceae

Habit: Erect, annual, undershrub.

Habitat: Grows on sandy soils in agriculture fields.

Economic importace: It grows as a weed in kharif crop. It is used as fodder for camels. However, has been reported to be toxic to horses in Australia. It contains pyrrolizidine alkaloids which are toxic to horses (Fletcher *et. al.* 2011).

Dalbergia sissoo Roxb.

Vernacular name: Sisham.

Family: Fabaceae

Habit: Tree.

Habitat: Grows in sandy moist soils in semi-arid regions.

Economic importance: It is a very impotant timber tree. It provides a high quality wood used for furniture, doors, and for other wooden structures. The young branches and leaves are used as fodder. It is grown as avenue tree for its dense shade and green canopy in summer season.

Indigofera sessiliflora DC.

Vernacular name: Bekario.

Family: Fabaceae

Habit: Annual, prostrate herb.

Habitat: Grows on sand dunes in arid regions.

Economic importance: It is used as fodder in West Africa.

Rhyncosia aurea (Willd.) DC.

Vernacular name: Batti.

Family: Fabaceae

Habit: Perennial, prostrate herb.

Habitat: Grows on sand dune and waste lands in arid regions.

Economic importance: The methanolic extract of *Rhyncosia aurea* possesses potent peripheral and central analgesic activity agaist stimuli (Drabu *et. al.* 2011).

Sesbania bispinosa (Jacq.) W.F. Wight

Vernacular name: Ikad.

Family: Fabaceae

Habit: Annual, tall herb.

Habitat: Grows in moist sandy abandoned fields and waste lands in semi-arid and arid regions.

Economic importance: It is a source of paper fibre. Leaves are used as fodder. It is also used as firewood. It is used as famine food in Africa. Natural gum obtined from it is used as a thckening agent. Beans are anthelmintic. It improves fertility of soil by nitrogen fixation.

Cassia obtusifolia Linn.

Vernacular name: Punwad.

Family: Caesalpiniaceae

Habit: Annual, small herb.

Habitat: Grows on sandy soils in waste lands in semi-arid and arid regions.

Economic importance: It has been reported to contain antimicrobial components (Kitanaka and Takido1986). It can be used to obtain carbohydrate based gum and also used as nematicide. It has invaded the Sariska Tiger Reserve and drastically suppressed the survival and growth of many herbaceous species (Gupta and Yadav 2006).

Cassia occidentalis Linn.

Vernacular name: Ratwa.

Family: Caesalpiniaceae

Habit: Annual, undershrub.

Habitat: Grows in sandy soils in abandoned fields and waste lands.

Economic importance: In taditional medicine, it is used for curing various diseases, with antibacterial, antifungal, anti-diabetic, anti-inflammatory, anticancer, antimutagenic and hepatoprotective activities, and is also used to treat snake bites (Yadav *et. al.* 2010). Seeds, roots and leaves are purgative. The leaf extract stimulates the healing of wounds caused by venom of *Bothrops moojeni* in mice and can be considered as an alternative product to treat snake bite wounds (Delmut *et. al.* 2013).

Acacia nilotica (Linn.) Del.

Vernacular name: Kikkar.

Family: Mimosaceae

Habit: Large tree.

Habitat: Grows in moist sandy soils of wastelands along water channels.

Economic importance: It is grown in social forestry scheme for food, fodder, timber and firewood to meet the requirements of local population. Young branches are used as tooth brushes in rural areas. It provides gum which is used as medicine. All parts are utilized for Ayurvedic medicines. It can be used against worms, skin diseases, cough and decaying teeth. It is an astringent, tightening and toning tissues. It is used to treat gonorrhoea and urinary tract infections.

Acacia tortilis (Forssk.) Hayne

Vernacular name: Vilayati babool.

Family: Mimosaceae

Habit: Large tree.

Habitat: Grown in wastelands in semi arid and arid regions.

Economic importance: It is an exotic species introduced to prevent desertification. It provides firewood. It can also be used to cure diabetes and hypercholesterolemia (Waheeb *et. al.* 2011).

Leucaena latisiliqua (Linn.) Gillis

Vernacular name: Pardesi-banwal.

Family: Mimosaceae

Habit: Small tree.

Habitat: Grown in waste lands as energy plantation.

Economic importance: It is a fast growing species introduced to provide fodder and firewood as alternative source of energy. It protects the soil from erosion, therefore, it is grown in strip cropping in Philippines. Leaves and seeds are used as vegetable. Seeds are also used as human necklaces. However, because of its high reproductve capacity and ability to grow in poor soils it may invade natural areas threatening local species.

Prosopis cineraria (Linn.) Druce

Vernacular name: Jand.

Family: Mimosaceae

Habit: Large tree.

Habitat : Grows in sandy soils in semi-arid and arid regions.

Economic importance: It is a multipurpose tree. It provides nutrient rich fodder, firewood, low quality timber, edible fruits and can be successfully used in agroforestry. Its immture fruits and dried fruits are used as vegetable in the desert. The bark is used for rheumatism, cough, common cold, asthma and scorpion stings in folk medicine.

Prosopis chilensis (Molina) Stunz

Vernacular name: Vilayati babool.

Family: Mimosaceae

Habit: Small tree.

Habitat: Grows in semi-arid and arid regions.

Economic importance: It was introduced to halt desertification in semi-arid and arid regions. However, in recent decades it has become an invasive species by colonising the natural forest areas in Rajasthan and other adjacent states. Its leaves and pods are used as fodder and its wood is used as firewood.

Eucalyptus globulus Labill.

Vernacular name: Safeda.

Family: Myrtaceae

Habit: Large tree.

Habitat: Grown along roadsides and as an enegy plantation.

Economic importance: It is grown in plantations to provide pulpwood and timber. Its timber is used in fence and construction works. An essential oil is extracted from leaves called eucalyptus oil has theropeutic value and also used in perfumery and flavouring. It also has antimicrobial and biopesticide properties.

Psidium guajava Linn.

Vernacular name: Amrood.

Family: Myrtaceae

Habit: Tree.

Habitat: Grown for its edible fruits in gardens.

Economic importance: It is grown for its nutritious and tasty fruits. Its leaf extract exhibits anticough, antibacterial, haemostasis, antidiarrhoeal, narcotic and antioxidant properties (Qian and Nihorimbere 2004).

Syzygium cumini (L.) Skeels.

Vernacular name: Jamun.

Family: Myrtaceae

Habit: Large tree.

Habitat: Grown in gardens and as an avenue tree.

Economic importance: It is grown for its nutritive fruits and dense shade in orchards and gardens. Its all parts are useful for diabetic patients. The whole fruit possesses hypoglycemic potential (Gupta and Saxena 2011).

Terminalia arjuna Wt. & Arn.

Vernacular name: Arjun.

Family: Combretaceae

Habit: Large, beautiful tree.

Habitat: Planted along roadsides and in gardens.

Economic importance: It is used in traditional medicine for cardiovascular disease, earaches, dysentery, sexually transmitted diseases, diseases of the urinary tract, and to increase sexual desire. *Terminalia arjuna* may be safe when used for three months or less. But it should be used under medical supervision as it might affect heart. Its tree bark powder has significant antioxidant action that is comparable to vitamin E and it also has a significant hypocholesterolaemic effect (Gupta *et. al.* 2001).

Ammannia auriculata Willd.

Vernacular name: Jal-bhangro.

Family: Lythraceae

Habit: An annual herb.

Habitat: Grows on the edges of irrigation channels.

Economic importance: The whole plant is of medicinal use, particularly the anticancer compounds reported from this plant (Gohar *et. al.* 2010). Two new oleananes have been isolated from it and its extract also exhibited antioxidant activities comparable with that of the standard antioxidant ascorbic acid (Gohar *et. al.* 2012).

Punica granatum Linn.

Vernacular name: Anar.

Family: Punicaceae

Habit: Shrub.

Habitat: Cultivated for fruits.

Economic importance: Its fruit juice is a delicacy taken internally, and some people use it in preparing ice-creams, jellies and marmalades. Fruit juice of this plant possesses diuretic and cooling effect and contains glucose, fructose, tannins, oxalic acid, and reduces thirst in cases of fevers, supplies the required minerals and helps the liver to preserve vitamin A from the food, increases the body's resistance to T. B. infection, and acts as a tonic for heart and kidney (Bhowmik *et. al.* 2013). In Indian Herbal System, all parts of pomegranate including roots, leaves, flowers, rind, seeds and the reddish brown bark are used medicinally. Leaves, immature fruit and fruit rind extract is given to combat diarrhoea, dysentery and hemorrhages, whilst powdered flower buds acts as a remedy for nose bleeding.

Ludwigia perennis Linn.

Vernacular name: Ludwigia.

Family: Onagraceae

Habit: An erect annual herb.

Habitat: Dry beds of ponds and along irrigation canals.

Economic importance: It is grown in fresh water aquaria.

Cucumis melo linn.var *agrestis* Naudil.

Vernacular name: Chibber.

Family: Cucurbitaceae

Habit: Profusely branched, creeping, annual or perennial herb.

Habitat: Grows throughout the country in wastelands, abandoned fields, and kharif crops in sandy soils in semi-arid and arid regions.

Economic importance: Its immature fruits are mainly consumed as vegetable, and eaten as fruits when mature. Fruits can be used as a moisturizer for skin, and as a first aid treatment for burns and abrasions. The flowers are expectorant and emetic while fruits are stomachic. Its seeds possess antitussive, digestive and vermifuge activity.

Citrullus colocynthis (Linn.) Schrad.

Vernacular name: Tumma.

Description: Annual, trailing, herb.

Habitat: Grows in waste lands and abandoned fields

Economic importance: The seed oil may be used for medicine and soap production. In traditional medicine, it is used for treatment of constipation (Alkofahi *et. al.* 1996), diabetes (Jayyat and Legssyer 1997), oedima, fever, jaundice, leukaemia, bacterial infections, cancer and used as an abortifacient (Madari and Jacobs 2004). Husseini *et. al.* (2009) have suggested that its fruit treatment improves the glycaemic profile without severe adverse effects in type II diabetic patients.

Momordica balsamina Linn.

Vernacular name: Barh karela.

Family: Cucurbitaceae

Habit: Annual climbing herb.

Habitat: Grows on trees and shrubs in sandy soils along roadsides, in agriculture fields and in forest in rainy season.

Economic importance: Its immature leaves are used as vegetable. A liniment made by infusing fruit in olive oil or almond oil is used as an application to chapped hands, burns and haemorrhoids. Its anti-malarial activity traditionally used in Niger, is confirmed without any toxicity in healthy mice (Benoit-Vical *et. al.* 2006). The leaves are used as soap substitute as well as arrow poison because of its saponin content. It is rich in minerals and vitamins (see Bharati and John 2013).

Momordica charantia Linn.

Vernacular name: Karela.

Family: Cucurbitaceae

Habit: Annual, climbing herb.

Habitat: Grown in sandy soils in agricultural fields in rainy season.

Economic importance: It is cultivated for fruits which are used as vegetable. The fruits contain a chemical that acts like insulin to reduce sugar level in diabetic patients. Fruits are also useful for gastro-intestinal upset, colitis, constipation and intestinal worms. It is also good for kidney stone, psoriasis and liver diseases, and as a supportive treatment for people with HIV/AIDS.

Mukia maderaspatana (Linn.) M. Roem.

Vernacular name: Ankh phutani-bel.

Family: Cucurbitaceae

Habit: Annual, climbing herb.

Habitat: Grows in sandy soils along roadsides and in agricultural fields in rainy season.

Economic importance: In Ayurvedic medicine, the leaves and tender shoots are considered as diuratic, stomachic, antipyretic, antitussive, antibronchitic and as an expectorant (Khare 2007). Saponanin, an antioxidant of the leaves posses hepatoprotective, hypoglycemic and antimicrobial properties.

Trianthema portulacastrum Linn.

Vernacular name: Kala sata.

Family: Aizoaceae

Habit: Annual, prostrate herb.

Habitat: Grown in sandy soils along roadsides and in waste lands in rainy season.

Economic importance: In indigenous medicine system, it is used as a medicine having cathartic and stomachic properties. It is also used as emmenagouge, diuretic and for the treatment of jaundice and dropsy. Alkaloid trianthemine and the steroid ecdysterone are its important chemical constituents.

Zaleya redimita (Melville) Bhandari

Vernacular name: Rati gudalio santo.

Family: Aizoaceae

Habit: Annual, prostrate herb.

Habitat: Grows in sandy soils along roadsides in waste lands in rainy season.

Economic importance: In traditional medicine system, it is used in conjuctivitis, menstrual regulation in females and to prevent wound infections.

Ageratum conyzoides Linn.

Vernacular name: Jungli pudina.

Family: Asteraceae

Habit: Perenial, prostrate herb.

Habitat: Grows in moist soils, water channels and marshy places.

Economic importance: It is a native of Tropical America and has become an invasive weed in india. It posseses insectcidal and nematicidal properties. However, it is toxic due to the presece of cetain pyrrolizidine alkaloids, lycopsamine and echinatine.

Artemisia scoparia Waldst. & Kit.

Vernacular name: Jhau.

Family: Asteraceae

Habit: Large, annual herb.

Habitat: Grows in sandy soils in smi-arid and arid regions.

Economic importance: It is considered as a fodder for goats. In traditional medicine, it is used to cure pain in the ear and the smoke of twigs is considered good for burns. The essential oil of *Artemisia scoparia* exhibited inhibitory effects against all oral bacteria tested (Cha *et. al.* 2005) and may be used as natural fumigant to control insects in stored products. Gilani and Janbaz (1993) reported that it contains hepatoprotective constituents. However, it is also considered as sever allergen.

Carthamus oxycantha Bieb.

Vernacular name: Kateli, Pohli.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as weed in agricultural fields after the havest of rabi crops.

Economic importance: It can be used as a biodiesel feed stock (Zadeh *et. al.* 2011).

Echinops echinatus Roxb.

Vernacular name: Unt-kantalo.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as a weed in abandoned fields and waste lands in sandy soils in the arid regions.

Economic importance: It exhibits anti-inflammatory activity. The flavonoid echinoside has been isolated from it. Every part of the plant is of some medicinal importance.

Eclipta prostrata Linn.

Vernacular name: Bharngraj.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows in moist soil along water channels.

Economic importance: In Ayurvedic medicine, the leaf extract is considered a powerful liver tonic and rejuvenative, and used for treatment of athlete's foot, eczema and dermatitis and especially good for the hair. It is used as anti-venom against snake bite in China and Brazil. It is also used for the treatment of memory disorders, fevers, rheumatic joint pains, enlarged spleen (Chopra *et. al.* 1956; Karnick and Kulkarni 1990; Karthikumar *et. al.* 2007).

Erigeron bonariensis Linn.

Vernacular name: Mirich booti.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as weed in abandoned fields and waste lands in sandy soils in the arid regions.

Economic importance: In traditional medicine system, it is used for urinary troubles.

Erigeron canadensis Linn.

Vernacular name: Phulni.

Family: Asteraceae

Habit: Annual herb.

Habitat: Native of North and Central America. Grows as weed in abandoned fields and waste lands in moist sandy soils and along the irrigation canals.

Economic importance: It is reported to help in relievng rhinitis.

Launaea procumbens (Roxb.) Ramayya & Rajgopal

Vernacular name: Van-gobi.

Family: Asteraceae

Habit: Annual or perennial herb.

Habitat: Grows as a weed in abandoned fields and in lawns of gardens.

Economic importance: It is nutritive, diuretic, stomachic and blood purifier. Its roots and leaves are given in leprosy and leucorrhoea.

Launaea resedifolia (Linn.) O.Kuntze

Vernacular name: Dhantar.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows on sand dunes in arid regions.

Economic importance: It is antibacterial. In Libya it is used for treatment of hepatic pains. It contains flavonoids, coumarins and phenolic acids. It possesses sedative, analgesic and anti-inflammatory properties (Auzi *et. al.* 2007).

Amberboa ramosa (Roxb.) Jafri

Vernacular name: Rissa.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as weed in abandoned fields and waste lands in this region.

Economic importance: In folk medicine, it is used as tonic, aperient, deobstruent and febrifuge. Its mucilage is used in cough. The plant yields a glycoside, procumbinin A. The acetone extract of this plant exhibited larvicidal and pupicidal activty against *Aedes aegypti* mosquito (Saxena and Yadav 1983).

Parthenium hysterophorus Linn.

Vernacular name: Gajar ghas, Congress grass.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as weed in abandoned fields and waste lands in moist soils.

Economic importance: It causes various types of allergies in human beings including asthma and skin diseases. It contains a toxin, sesquiterpene lactone which is a major component of pathenin and other phenolic acids such as caffeic acid, vanillic acid, ansic acid, etc. harmful to human beings. In folk medicine in Caribean and Central America, it is used to cure skin disorders. It is also used as a flea repellent both for dogs and animals in Jamaica.

Sonchus asper (L.) Hill.

Vernacular name: Pili dudhi.

Family: Asteraceae

Habit: Annual herb.

Habitat: Grows as weed in abandoned fields and waste lands in moist soils.

Economic importance: The leaves of this plant are edble as nutritious vegetable. However, it may cause irritation ranging from sensation, redness and mild to severe rashes when someone comes in contact of its hairs. In folk medicne, it is applied to wounds and boils.

Tridax procumbens Linn.

Vernacular name: Lathjoka.

Family: Asteraceae

Habit: Herb.

Habitat: Grows as weed in abandoned fields in moist soils.

Economic importance: It is anticoagulant, antifungal and insect repellent. It is used in bronchitis, diarrhoea, jaundice and dysentry. It promotes hair growth. The leaf gel shows antiseptic, insecticidal and parasiticidal properties.

Verbesina encelioides (Cav.) Benth. & Hook.f.

Vernacular name: Verbesina.

Family: Asteraceae

Habit: Perennial, erect, herb.

Habitat: Grows as a weed in wastelands in sandy soils in arid regions.

Economic importance: It is a native of Mexico and USA. It reduces the indigenous plants through its allelopathic effects. Sometimes grown as ornamental plant. In folk medicine, it is considered anti-inflammatory for use against gum sores.

Xanthium strumarium Linn.

Vernacular name: Bichhu-buti.

Family: Asteraceae

Habit: Annual gregarious herb.

Habitat: Grows as a weed in wastelands and on roadsides in semi-arid regions.

Economic importance: It is toxic to animals. The seeds and seedlings of this plant contain an extremely toxic chemical, carboxyataratyloside and the mature plants also contain four toxins.

Salvadora oleoides Decne.

Vernacular name: Van, Jal.

Family: Salvadoraceae

Habit: Small, evergreen tree.

Habitat: Grows in sandy saline soils in the semi-arid and arid regions.

Economic importance: It is an evergreen tree which provides shade, fodder and shelter to animals in hot dry summer season in the desert. Its fruits are sweet, acidic, rich in nutrients and vitamins and these are edible. The firewood and dry leaves are a good source of energy . It also stabilizes sand dunes and reduce soil erosion. Its leaves show anti-inflammatory, analgesic and anticancer activities. Yadav *et. al.* (2008) reported decrease in cholesterol and LDL levels by administration of ethanolic extract in alloxan rats. The stem bark shows antibacterial activity due to the presence of flavonoids and tannins (Singh *et. al.* 2013).

Calotropis procera (Ait.) R. Br.

Vernacular name: Aak.

Family: Ascepiadaceae

Habit: Erect, highly branched shrub.

Habitat: Grows in sandy soils in the semi-arid and arid regions.

Economic importance: Its bark and roots are used in traditional medicine for digestive disorders, painful tooth, elephantiasis and extracts effective against worms. In inhalation therapy, smoke from bark is inhaled for cough, asthma and to cause sweating.

Leptadenia pyrotechnica (Forssk.)Decne.

Vernacular name: Kheep.

Family: Asclepiadaceae

Habit: Erect, much-branched, leafless shrub.

Habitat: Thrives on sand dunes in the arid region.

Economic importance: It is used as fodder for camels, fruits are used as vegetable, and fibrous branches are used for making ropes, baskets and thatched houses. The fruits are used as food and medicine. Its antioxidant, anti-inflammatory and anticancer properties are useful in therapeutic, and functional food applications (Khasawneh *et. al.* 2011). The anthelmintic activity of alcohol extract and aqueous extract of the whole plant has been demonstrated (Kumar *et. al.* 2011).

Arnebia hispidissima (Lehm.) DC.

Vernacular name: Kunden.

Family: Boraginaceae

Habit: Annual herb.

Habitat: Grows in sandy soils in the arid regions.

Economic importance: The whole plant is used for cure of tongue and thoat ailments in traditional medicine. The crude extract of roots showed antimicrobial and mild antifungal activity (Jain 2000). It is toxic due to the presence of pyrrolizidine alkaloids monocrotaline and echimidine.

Heliotropium bacciferum Forssk.

Vernacular name: Kali-bui.

Family: Boraginaceace

Habit: Perennial herb.

Habitat: Grows in sandy soils in arid regions.

Economic importance: In Niger the dried and powdered plants are added to water and drunk to combat fatigue. Leaf sap is applied to burns in Mauritiana. It is used to treat gonorrhoea and to increase lactation in women. It is also used as fodder in Mauritiana for camels and other livestock (PROTA 2008). Four pyrrolizidine alkaloids were isolated from *Heliotropium bacciferum* and identified as heleurine, heliotrine, supinine and europine (Farrag *et. al.* 1996).

Heliotropium curassavicum Linn.

Vernacular name: Heliotropium.

Family: Boraginaceace

Habit: Perennial herb.

Habitat: Grows in moist, saline soils.

Economic importance: *H. curassavicum* is cultivated as ornamental plant. The plant is dried and used to brew tea as a tonic by the early Hawaiians (USDA-ARS 2010).

Heliotropium ovalifolium Forssk.

Vernacular name: Kunden.

Family: Boraginaceae

Habit: Annual herb.

Habitat: Grows in sandy soils in the arid regions.

Economic importance: It is reported to be toxic and responsible for liver diseases in horses grazing on this plant in Australia (Creeper *et.al*. 1999). The benzoquinines, heliotropinases A and B reported from *Heliotropium ovalifolium,* exhibited antifungal and antibacterial activity (Guntern *et. al.* 2001). A new alkaloid, Heliotropamide (1) isolated from its aerial parts also exhibited antifungal and antibacterial activity (Guntern *et. al.* 2003).

Heliotropium strigosum Willd.

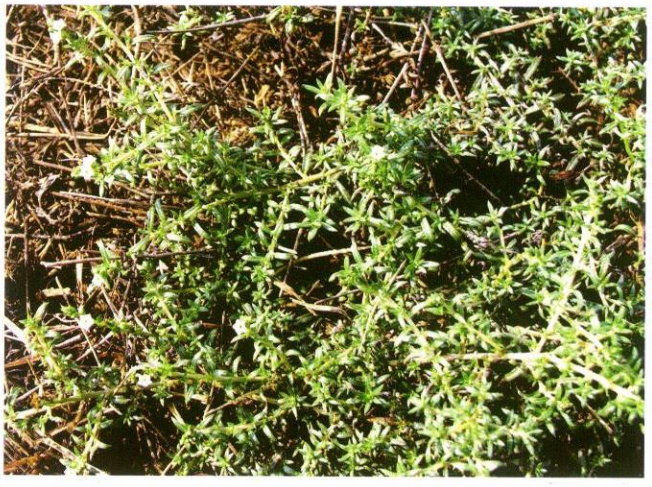
Vernacular name: Chitiphul.

Family: Boraginaceace

Habit: Perennial herb.

Habitat: Grows in lawns and wastelands in sandy soils in arid regions.

Economic importance: Traditionally it is used as laxative and diuretic. The juice of the plant is used to treat gum boils, sore eyes and also as a cure of stings of nettles, insects and snake bites (Hussain *et. al.* 2010). Shah *et. al.* (2013) reported that it exhibits cytotoxic and phytotoxic potential which explore its use as anticancer and herbicidal mediation.



Heliotropium subulatum Hochst.ex DC.

Vernacular name: Kali-bui.

Family: Boraginaceace

Habit: Annual herb.

Habitat: Grows in sandy soils in waste lands in arid regions.

Economic importance: It is used as fodder in rural areas. It also possesses medicinal properties. According to Singh *et. al.* (2002a) 7-angeloyl heliotrine and retronecine showed 38 % inhibition against Sarcoma 180. Singh *et. al.* (2002b) reported that 7-angeloyl heliotrine, retronicine and heliotrine inhibited bacterial and fungal growth at 2mg/disk exhibiting their antimicrobial activity.

Cordia dichotoma Forst.f.

Vernacular name: Lasura.

Family: Ehretiaceae

Habit: Small tree.

Habitat: Grows in wastelands and gardens.

Economic importance: The leaves, roots, bark, seeds and fruits of this plant posssess immunomodulatory, antidiabetic, anthelmintic, antcancer, antilarvicidal and hepatoprotective activities (Hussain and Kakoti 2013).

Convolvulus arvensis Linn.

Vernacular name: Hirankhuri.

Family: Convolvulaceae

Habit: Annual and perennial twining herb.

Habitat: Grows in sandy soils in waste lands in arid regions.

Economic importance: This plant acts as a sand binder so it is used for the conservation of soil.

Convolvulus microphyllus Sieb. ex Spreng.

Vernacular name: Shankhpushpi.

Family: Convolvulaceae

Habit: Procumbent, prostrate, perennial herb.

Habitat: Grows in waste lands, play grounds, open forest areas and on roadsides in north-west India.

Economic importance: It is an important source of a drug known as sankhpushpi. It is used as a laxative and as a brain tonic (Bhandari 1990). The plant is reported to be prominent in improving memory. It is used as a psycho-stimulant and tranquilizer. Pawar *et. al.* (2001) suggested that the whole plant extract of *Convolvulus microphyllus* possesses a potential CNS-depressant activity.

Ipomoea aquatic Forssk.

Vernacular name: Kalmi-sak.

Family: Convolvulaceae

Habit: Perennial, twining herb.

Habitat: Grows in sandy soils in waste lands and fallow land.

Economic importance: The leaves are used as vegetable. If eaten raw it may cause fasciolpsiasis by transmitting an intestinal fluke worm in humans and pigs. It is laxative, used for piles and in certain nervous conditions shuch as sleeplessness and headache. The seeds are a strong pesticide (Naples 2005).

Ipomoea carnea Jacq.

Vernacular name: Vilayati-aakra.

Family: Convolvulaceae

Habit: Perennial herb.

Habitat: Grows in moist soils near irrigation channels or ponds.

Economic importance: Dry twigs are used as fuel. It is used to treat dysentry and venereal diseases. Roots are boiled to use as laxative. The milky latex has been used to cure leucoderma other skin diseases. It is used as cathartic to purge bowels and to cease post-partum bleeding.

Ipomoea eriocarpa R.Br.

Vernacular name: Rota-belari.

Family: Convolvulaceae

Habit: Annual, twining herb.

Habitat: Grows in sandy soils in wastelands and fallow land in semi-arid and arid regions.

Economic importance: The whole plant is used for ulcers, fever and rheumatism. Prasad *et. al.* (2012) reported that *Ipomoea eriocarpa* possesses significant analgesic activity, which confirms the traditional claims about this plant.

Ipomoea indica (Burm.) Merrill.

Vernacular name: Morning glory.

Family: Convolvulaceae

Habit: Perennial herbaceous twiner.

Habitat: Grows in sandy soils in waste lands.

Economic importance: It is grown for its beautiful flowers.

Ipomoea pes-tigridis Linn.

Vernacular name: Bili-ki-ankh.

Family: Convolvulaceae

Habit: Annual, twinning herb.

Habitat: Grows in sandy soils in wastelands and fallow land in semi-arid and arid region.

Economic importance: It is a source of Ayurvedic medicine, vyaghrapada. The plant is used by Kerala tribes to treat painful conditions like headache, swellings, poisonous stings and snake bites.

Ipomoea sindica Stapf

Vernacular name: Rota-belari.

Family: Convolvulaceae

Habit: Annual, prostrate herb.

Habitat: Grows in sandy soils in waste lands and fallow land in semi-arid and arid region.

Economic importance: It is grazed by animals.

Merremia aegyptia (Linn.) Urban

Vernacular name: Ipomoea.

Family: Convolvulaceae

Habit: Annual, twining herb.

Habitat: Grows in sandy soils in wastelands and fallow land in rainy season.

Economic importance: The stem yields fibres. It is used as fodder. Leaves have healing properties. In Nigeria, dried leaves are used as a dressing for burns.

Datura stramonium Linn.

Vernacular name: Datura.

Family: Solanaceae

Habit: Annual, erect herb.

Habitat: Grows in sandy soils in wastelands and on roadsides.

Economic importance: It is used in asthma, parkinson's disease and hemorrhoids. Leaves, flowering tops and seeds are antiasthmatic, hallucinogenic, hypnotic, mydriatic and narcotic in activity. The leaves contain hyoscyamine and atropine which can be mind altering drugs.

Lycium barbarum Linn.

Vernacular name: Murali.

Family: Solanaceae

Habit: Profusely branched, straggling, spinous shrub.

Habitat: Grows in sandy soils in open scrub vegetation in the desert.

Economic importance: It has been termed as a superfruit for their nutrient value and antioxidant activities. In Tibet it is known as "key to eternal youth". The daily consumption of fresh fruit juice significantly increased several immunological responses and subjective feeling of general well being without any adverse reactions (Amagase *et. al*. 2009). It is also used for the treatment of diabetes mellitus and hypertension (Potterat 2010).

Physalis peruviana Linn.

Vernacular name: Palpota.

Family: Solanaceae

Habit: Annual, erect herb.

Habitat: Grows in sandy soils in wastelands and on roadsides in semi-arid and arid region.

Economic importance: Its berries are eaten and good for health as they are rich in certain antioxidants, vitamins, minerals and fibres. The plant is used to cure malaria, asthma, hepatitis, dermatitis and rheumatism.

Solanum nigrum Linn.

Vernacular name: Makoi.

Family: Solanaceae

Habit: Annual, erect herb.

Habitat: Grows in sandy soils in wastelands and on roadsides.

Economic importance: The fruits of this plant are used as famine food. In South India, leaves and berries are consumed as food after cooking with onion, tamarind and cumin seeds. In folk medicine, it is used as tonic, laxative, apetite stimulant and for asthma. It also shows antioxidant, anti-inflammatory, hepatoprotective, diuretic and antipyretic activities. However, all parts of this plant are toxic containing glycoalkaloids. A deccotion of berries and flowers is useful in cough (Mukhopadhyay and Ghosh 1993).

Solanum surattense Burm.f.

Vernacular name: Neeli-kateli.

Family: Solanaceae

Habit: Perennial, prostrate, prickly herb.

Habitat: Grows in sandy soils in waste lands and on roadsides in semi-arid and arid region.

Economic importance: It is for the cure of cold, fever, enlargment of liver, muscular pain, and stone in urinary bladder. Roots and seeds are used as expectorant and in curing asthma, cough and chest pain in folk medicine. The fruits are aphrodisiac for males.

Withania somnifera (Linn.)Dunal

Vernacular name: Aswagandha.

Family: Solanaceae

Habit: Annual, erect undershrub.

Habitat: Grows in sandy soils in wastelands and abandoned fields in semi-arid and arid region.

Economic importance: The roots of this plant are used to prepare the medicine, ashwagandha, which is used to cure arthritis, anxiety, insomnia, tumors, tuberculosis, asthma, bronchitis, backache, hiccups and chronic liver diseases and as a general tonic (Mishra *et. al.* 2000). Cooley *et. al.* (2009) stated that ashwagandha showed greater clinical benefits than psychotherapy in mental health (anxiety level), concentration, fatigue, social functioning, vitality and overall quality of life. The leaves contain steroid lactones, withanolides notably withferin A which was the first to be isolated from the plant.

Verbascum thapsus Linn.

Vernacular name: Gidder-tobaco.

Family: Scrophulariaceae

Habit: Annual, erect herb.

Habitat: Grows in sandy soils in fallow lands in moist soils.

Economic importance: It is used for dyeing. Seeds are used as piscicide for fishing. An infusion of root is used for cure of athletes foot. Its prepartions are useful for treatment of warts, boils and rheumatism. It is an astringent and emollient as it contains mucilage, coumarins, saponins and glycosides.

Tecomella undulata (Sm.) Seem.

Vernacular name: Rohira.

Family: Bignoniaceae

Habit: Large tree.

Habitat: Grows in sandy soils in waste lands and agriculture fields in semi-arid and arid region.

Economic importance: It provdes high quality timber, therefore, it is also called the Marwar teak. In traditional medicine, it is used as a remedy of gonorrhoea, syphilis, urinary disorders, enlargement of spleen, leucoderma and liver disorders (Chal *et. al.* 2011). It is also used as blood purifier and in wound healing. It also showed anti-HIV, antibacterial, antimicrobial, immunmodulator, analgesic and hepatoprotecive activities (Jain *et. al.* 2012).

Peristrophe paniculata (Forssk.) Brummitt

Vernacular name: Kagner.

Family: Acanthaceae

Habit: Annual, erect herb.

Habitat: Grows in sandy soils in wastelands and on roadsides.

Economic importance: An essential oil obtained from this plant showed tuberculostatic activity. It is used as antidote for snake poison and as antinematode and pesticide. The plant contains alkaloids, tannins, steroids and flavonoids which indicate its antimicrobial potential.

Phyla nodiflora (Linn.) Greene

Vernacular name: Jalpapali

Family: Verbenaceae

Habit: Prostrate, perennial herb.

Habitat: Grows in moist sandy loam soils in parks and fallow lands.

Economic importance: It is useful in cure of many problems such as pain in knee joints, for lack of bowl movement, ulcers and boils, in swollen cervical glands. It is used in gonorrhoea (Sharma and Singh 2013). It is used to cure coughs, cold and the juice of this plant is used in treatment of gastric troubles (Manandhar 2002). It is used as herbal drink and a nourishing agent and an immuno-modulator and anti-inflammatory agent to prevent many diseases in Tiwan (Yang *et. al.* 1998).

Lantana camara Linn.

Vernacular name: Chuder-buti.

Family: Verbenaceae

Habit: Straggling shrub.

Habitat: Grows in moist soils along roadsides, canals and lakes.

Economic importance: It was introduced as an ornamental plant, however, now it has become an invasive species. It has invaded natural forest areas and has suppressed the growth of indigenous species. The positive aspect of it is that it provides shelter to wildlife in regions where it grows. The extract of fresh leaves is traditionally used as antipyretic, carminative and cure of respiratory infections.

Boerhaavia diffusa Linn.

Vernacular name: Punarnava.

Family: Nyctaginaceae

Habit: Perennial, prostrate herb.

Habitat: Grows in sandy soils along roadsides and in wastelands.

Economic importance: It is used as a fodder for domestic animals in rural areas. The tribles eat this plant as a vegetable in West Bengal (Purulia) and Assam. It is used for a large number of human diseases. The multiple benefits of *Boerhaavia diffusa* made it a true miracle of nature (Banjare *et. al.* 2012). The whole plant is used in treatment of biliousness, jaundice, intestinal inflammation and constipation (Borreli *et. al.* 2005). It is also used in asthma, congestion, as blood purifier, cardiotonic and treatment of anaemia (Borreli *et. al.* 2006).

Achyranthes aspera Linn.

Vernacular name: Latzira.

Family: Amaranthaceae

Habit: Erect or annual herb.

Habitat: Grows in sandy soils along roadsides and in wastelands.

Economic importance: In folk medicine, the crushed plant is used in pneumonia. It is diuretic, purgative, laxative, antiasthmatic, hepatoprtective, anti-allergic and has various other medicinal properties. It is also used in skin eruptions, dropsy, pilose boils, renal disorder, colic, hydrophobia and snake bites (Mukhopadhyay and Ghosh 1993).

Aerva persica (Burm. F.) Merrill

Vernacular name: Bhui.

Family: Amaranthaceae

Habit: Profusely branched, erect, hoary tomentose perennial herb.

Habitat: Grows in sandy soils in wastelands in arid regions.

Economic importance: It is grazed by animals in the desert. Ascorbic acid and two flavonoids have been identified from this plant. It possesses diuretic, and antioxidant properties.

Aerva pseudotomentosa Blatt. & Hallb.

Vernacular name: Bui

Family: Amaranthaceae

Habit: Profusely branched, erect, hoary tomentose perennial herb.

Habitat: Grows in sandy soils in wastelands.

Economic importance: It is also grazed by animals in the desert. The whole plant is used for cure of gastric problems, in pain relief, rheumatism, and venereal diseases. It has been used as anti-inflammatory, analgesic, anthelmintic and as a tonic (Agarwal *et. al.* 2013).

Digera muricata (L.) Mart.

Vernacular name: Lesua.

Family: Amaranthaceae

Habit: Erect annual herb.

Habitat: Grows in sandy soils in abandoned fields and wastelands.

Economic importance: Its leaves and spikes are used as vegetable. The crushed plant is used as mild astringent in bowel complaints. It is used internally against digestive system disorders and seeds and flowers are used to treat urinary disorders. Leaf paste is applied to prevent pus formation (Katewa and Chaudhary 2004). Analysis of various fractions of the *Digera muricata* indicated the presence of flavonoids, alkaloids, terpenoids, saponins, coumarins, tannins, cardiac glycosides and anthraquinones (Sharma and Vijyergia 2013).

Pupalia lappacea (Linn.) Juss.

Vernacular name: Undio-bhurat.

Family: Amaranthaceae

Habit: Erect, perennial herb.

Habitat: Grows in sandy soils along roadsides and in wastelands.

Economic importance: It is grazed by animals. It also act as a sand binder, and used for fishing in Nigeria. In traditional medicine, it is used for venamous stings, diarrhoea, dysentry, dropsy, oedema, gout, skin and venreal diseases. It has steroids, flavonoids and phenolic compounds which may be responsible for antinociceptive and antipyretic activities (Neeharika *et.al.* 2013).

Chenopodium ambrosioides Linn.

Vernacular name: Bathawa.

Family: Chenopodiaceae

Habit: Erect, tall, perennial herb.

Habitat: Grows in sandy saline soils along roadsides and in wastelands.

Economic importance: It is toxic plant if grazed by animals. However, it is taken against internal worms in Mexico.

Kochia indica Wt.

Vernacular name: Bui.

Family: Chenopodiaceae

Habit: Much branched, large, annual herb.

Habitat: Grows in sandy saline soils along roadsides and in wastelands in arid regions.

Economic importance: It is grazed by animals in the desert. It may be used for the reclamation of highly saline soils.

Polygonum barbatum Linn.

Vernacular name: Jal-bahar.

Family: Polygonaceae

Habit: Erect, perennial herb.

Habitat: Grows along irrigation canals, dry beds of ponds and in marshy places in waste lands.

Economic importance: Mazid *et. al.* (2009) reported considerable antinociceptive, anti-inflammatory and diuretic properties of the extracts of *Polygonum barbatum* var. *barbata*, suggesting this plant to be a potential source for the discovery and development of newer analgesic, anti-inflammatory and diuretic 'leads' for drug development. Kinger (2012) observed that antiulcer activity of the whole plant extracts may be due to the presence of phytochemical constituents such as saponins, sterols, mucilage, glycoside, alkaloids, steroidal saponins as these phytochemical constituents were already reported for the above mentioned effects.

Chrozophora verbascifolia A. Juss.

Vernacular name: Chrozophora.

Family: Euphorbiaceae

Habit: Erect, annual herb.

Habitat: Grows in sandy saline soils in waste lands.

Economic importance: It is known as acrid and poisonous plant.

Croton bonplandianum Bail.

Vernacular name: Kalabhangre.

Family: Euphorbiaceae

Habit: Erect, annual herb.

Habitat: Grows in sandy soils in waste lands and on roadsides.

Economic importance: In traditional medicine, it is used to cure liver diseases, swelling of body, skin diseases and against worms. Seeds are used for treatment of jaundice, acute constipation, abdominal dropsy and internal abscess. Latex has healing effect on wounds and cuts. Roots are used to stop abnormal bleeding after child birth. The plant exhibited significant wound healing due to its chemicals rutin and antioxidant enzymes (Divya *et. al.* 2011).

Euphorbia clarkaena Hook. f.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Erect, annual herb.

Habitat: Grows in sandy saline soils in waste lands and fallow lands.

Economic importance:It is used for wound healing.

Euphorbia heyneana Spreng.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Prostrate, annual herb.

Habitat: Grows in sandy saline soils in waste lands and fallow lands.

Economic importance: Its extract is beneficial in jaundice. It is also able to lower the elevated levels of serum bilirubin (Pullaiah 2006). Battu *et. al.* (2011) suggested that alcoholic extract of *E. heyneana* shows good *in vitro* antioxidant and *in-vivo* anti-inflammatory activities in rats.

Euphorbia hirta Linn.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Annual, prostrate or decumbent herb.

Habitat: Grows in sandy soils in waste lands and on roadsides.

Economic importance: Leaves of this plant contain flavonoids, polyphenols, tannins, alkaloids, sterols, glycosides and triterpinoides (Kumar *et. al.* 2010). It is used as antidiarrheal, antispasmodic, anti-iflammatory, antifungal, anticancer, antimalarial, and antibacterial. In folk medicine, it is reported to increase the milk flow in woman and also used to cure bronchitis, asthma, cough, eczema and dysentry. Its latex is applied in case of conjuctivitis and ulcerated cornea.

Euphorbia granulata Forssk.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Annual, prostrate herb.

Habitat: Grows in sandy soils in waste lands and fallow lands.

Economic importance: Analysis of *Euphorbia granulata* revealed that only copper and Chlorides were present in small amount while the rest of micro and macro minerals are present in high concentrations. It is suggested that the plant could be a good source of these minerals (Parvez *et. al.* 2013).

Euphorbia chamaesyce Linn.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Prostrate, annual herb.

Habitat: Grows in sandy saline soils in waste lands and fallow lands.

Economic importance: The extract of this plant contains flavonoids, phenolics and phenolic acids due to which it can be used for treatment of hemorrhoids. Gupta (2011) has shown that extract of *Euphorbia chamaesyce* can be used for early grades of hemorrhoids.

Euphorbia thymifolia Linn.

Vernacular name: Dudhi.

Family: Euphorbiaceae

Habit: Prostrate, annual herb.

Habitat: Grows in sandy saline soils in waste lands and fallow lands.

Economic importance: In traditional medicine, it is repoted to be beneficial in diarrhoea and bleeding of piles. It is diuretic, laxative, antimalarial, detoxificant and antihemorrhoidal.

Phyllanthus emblica Linn.

Vernacular name: Anwla.

Family: Euphorbiaceae

Habit: Small tree.

Habitat: Grown as plantations for edible fruits.

Economic importance: It is grown in plantations for its fruits. The fruits are rich in vitamin C and minerals. Several Ayurvedic medicines are prepared from its fruits which are used for the treatment of cough, cold, constipation, digestive diseases and as a general tonic.

Phyllanthus fraternus Webster

Vernacular name: Gugaria.

Family: Euphorbiaceae

Habit: Annual herb.

Habitat: Grows as a weed in gardens and abandoned fields.

Economic importance: In Ayurvedic medicine, it is used to cure diseases of stomach, genitourinary system, liver, kidney and spleen. The extract of this plant exhibits significant antitumour actvity which suppports the traditional utilization of this plant (Sharma *et. al.* 2009). Manjrekar *et. al.* (2008) confirmed the hepatoprotective and antioxidant activity of the extract of this plant. However, the plant extract showed potentially toxic effects on kidney and testes. Alternatively, it can be exploited for use as an antifertility drug.

Ficus benghalensis Linn.

Vernacular name: Bargad.

Family: Moraceae

Habit: Huge tree.

Habitat: Grown as a shade plant in this region.

Economic importance: This tree is grown for it dense and cool shade. Leaves are used as fodder. Stem is used by some local people for house building. The bark is traditionally used as tonic, astringent, cooling and it is diuretic.

Ficus religiosa Linn.

Vernacular name: Pipal.

Family: Moraceae

Habit: Tall tree.

Habitat: Grown as a shade tree throughout the country.

Economic importance: It has mythological, religious and medicinal importance in India. Leaves are used as fodder. In Ayurvedic medicine, it is used as rejuvenate, antioxidant and to relieve stress in the body. Its bark is astringent, cooling, aphrodisiac, antibacterial, anti-inflammatory and used for treatment of diarrhoea, dysentry and haemorrhoea. Leaf juice is used for the cure of asthma and cough.

Morus alba Linn.

Vernacular name: Sahtoot.

Family: Moraceae

Habit: Small tree.

Habitat: Grown along roadsides and in gardens.

Economic importance: It is grown for its edible fruits which are cooling and laxative. Fruits are also used for sore throat, dyspepsia and melancholia. Bark possesses vermifuge and purgative properties. Wood is also suitable for house building, agricultural equipments, furniture and fuel.

Cannabis sativa Linn.

Vernacular name: Bhang.

Family: Cannabinaceae

Habit: Tall, erect herb.

Habitat: Moist sandy soils in rainy season.

Economic importance: Seed oil of this plant is used for cooking, lamps and paints. Bark yields fibres used for making cords, twines, sacks, bags and rough clothes (Manandhar 1993). Leaves, stem and flowers of *Cannabis sativa* contain psychoactive chemical compounds called cannabinoids, are consumed for recreational, medicinal and spiritual purposes. Marijuana and hashish are prepared from its plant parts.

Commelina benghalensis Linn.

Vernacular name: Bakhana.

Family: Commelinaceae

Habit: Small, prostrate, decumbent, annual herb.

Habitat: Moist sandy soils in rainy season.

Economic importance: It is grazed by animals. Leaves of this plant are edible and fried with gram flour as pakoras. It is also used as laxative and for treatment of leprosy. In folk medicine, it is used for cure of scorpion stings.

Cyperus bulbosus Vahl

Vernacular name: Motha.

Family: Cyperaceae

Habit: Annual, erect herb.

Habitat: Grows on sand dunes and in sandy soils in arid region.

Economic importance: It is used as famine food.

Cyperus compressus Linn.

Vernacular name: Motha.

Family: Cyperaceae

Habit: Annual, erect herb.

Habitat: Grows on sand dunes and in sandy soils in arid region.

Economic importance: It is grazed by animals and particularly asses.

Cyperus corymbosus Rottb.

Vernacular name: Motha.

Family: Cyperaceae

Habit: Annual, erect herb.

Habitat: Grows on roadsides and in waste lands.

Economic importance: It is grazed by animals.

Cyperus rotundus Linn.

Vernacular name: Motha.

Family: Cyperaceae

Habit: Perennial herb.

Habitat: Grows on waste lands, crop fields, on roadsides and in gardens in rainy season.

Economic importance: The rhizome is used in medicine as diaphoretic, astringent, stimulant and diuretic. In Ayurvedic medicine, it is used in stomach disorders and dysentry.

Aristida adscensionis Linn.

Vernacular name: Lamp.

Family: Poaceae

Habit: Annual, grass.

Habitat: Grows on sand dunes and in sandy soils in arid regions.

Economic importance: It is grazed by animals when other fodder is not available in dry areas. The extracts of root, shoot and litter exhibit allelopathic effects and inhibit the growth of nitrogen fixing bacteria (Murthy and Ravindra 1975; Murthy and Nagodra 1977).

Arundo donax Linn.

Vernacular name: Wild cane.

Family: Poaceae

Habit: Tall, tufted, perennial grass.

Habitat: Grows in moist soils near water channels and ponds.

Economic importance: It is grazed by animals. Its stem is used for making instruments, such as oboe, basson, clarinet, saxophone, bagpipes, fluits and woodwind instrument. Stems are also used in house construction. It may be used as energy crop for its fast growing ability and adaptation to poor, saline soils and saline water.

Bambusa balcooa Roxb.

Vernacular name: Baluka.

Family: Poaceae

Habit: Perennial shrub.

Habitat: Grows in moist soil.

Economic importance: It is an indigenous widespread bamboo of North East India. It is tall, strong and durable and is utilized mostly for structural purposes and pulping. The species is also valued for its edible tender shoots, mainly for food and for pickling.

Cymbopogon jwarancusa (Jones) Schult.

Vernacular name: Buraro.

Family: Poaceae

Habit: Perennial tufted grass.

Habitat: Grows on sand dunes and in sandy soils in arid region.

Economic importance: It is an aromatic grass. It is used for cure of vomiting, abdominal tumours, unconsciousness, blood impurities and skin problems in traditional medicine. Its oil contains geraniol which is antimicrobial and can be used for the cure of skin allergies, gout and cardio vascular diseases (Bose *et. al.* 2013). Prasad *et. al.* (2013) showed that extracts of this grass have antioxidant activity.

Cenchrus biflorus Roxb.

Vernacular name: Bhurat.

Family: Poaceae

Habit: Annual, ascending grass.

Habitat: Grows on sand dunes and in sandy soils in waste lands in arid regions.

Economic importance: It is edible and highly nutritious. People in rural areas regularly collect the seed, elsewhere it is considered a famine food. It is eaten raw or used, mixed with pearl millet, to make bread. In normal years it is mixed with sugar and 'ghee', and eaten as a children's food. The plant is used as a fodder and it is sown against desertification. The root of *Cenchrus biflorus* is an ingredient of traditional aphrodisiac prescriptions.

Cenchrus ciliaris Linn.

Vernacular name: Dhaman.

Family: Poaceae

Habit: Annual, ascending grass.

Habitat: Grows on sand dunes and in sandy soils in waste lands in arid regions.

Economic importance: It is grazed by animals in young growth stage.

Cenchrus pennisetiformis Hochst.&Steud.

Vernacular name: Dhaman.

Family: Poaceae

Habit: Annual, ascending grass.

Habitat: Grows in nutrient rich sandy soils in wastelands and does not prefer kallar soils.

Economic importance: It is highly nturitious grass which can be stacked for about 15 years. It is considered best of all grasses. However, horse will not eat it as it is bitter. This grass, as the zamindars say, if in good condition gives a semi-intoxicating effect to milk of buffloes who graze on it (Coldstream 1889). *Cenchrus pennisetiformis* is an extremely valuable fodder grass as it remains green during the dry season.

Cenchrus prieurii (Kunth) Maire

Vernacular name: Lamba-bhurat.

Family: Poaceae

Habit: Annual, ascending grass.

Habitat: Grows on sand dunes and in sandy soils in waste lands in arid regions.

Economic importance: It is grazed by animals in young growth stage.

Cenchrus setigerus Vahl

Vernacular name: Dhaman.

Family: Poaceae

Habit: Annual, ascending grass.

Habitat: Grows on sand dunes and in sandy soils in waste lands in arid regions.

Economic importance: It is preferentially grazed by animals in young growth stage.

Cynodon dactylon (Linn.) Pers.

Vernacular name: Dhoob.

Family: Poaceae

Habit: Perennial, grass.

Habitat: Grows as weed in crop fields and along roadsides.

Economic importance: It is grown in lawns of gardens and parks for the aesthetic value of greenery created by it. This grass is also used in religious ceremonies. It is also preferred by grazing animals. In traditional medicine, the juice of leaves is used for healing cuts.

Dactyloctenium aegyptium (Linn.) P. Beauv.

Vernacular name: Makara.

Family: Poaceae

Habit: Annual prostrate, ascending grass.

Habitat: Grows in wastelands and on roadsides.

Economic importance: It is a main source of fodder for cattle and wild animals. It is used as famine food in Africa and sand binder in Australia. In traditional medicine, in Manipur the juice of fresh plant is used to cure fever. Decoction of plant is given in small pox.

Dactyloctenium sindicum Boiss.

Vernacular name: Makara.

Family : Poaceae

Habit: Perennial, prostrate, ascending grass.

Habitat: Grows in sandy soils in fallow lands.

Economic importance: It is grazed by animals in young growth stage.

Dichanthium annulatum (Forssk.) Stapf

Vernacular name: Karad.

Family: Poaceae

Habit: Perennial, tufted grass.

Habitat: Grows in sandy soil in fallow lands.

Economic importance: It is grazed by animals throughout the year.

Digitaria ciliaris (Retz.) Koeler

Vernacular name: Jharani.

Family: Poaceae

Habit: Erect, annual grass.

Habitat: Grows in fallow lands and on roadsides.

Economic importance: It is grazed by animals throughout the growing season.

Echinochloa colonum (Linn.) Link.

Vernacular name: Swankh.

Family: Poaceae

Habit: Annual grass.

Habitat: Grows in moist soils in water bodies.

Economic importance: The grains of this grass are used for making bread. Its grains are boiled with rice and made into khir. The grains are also eaten by Hindus on fast days. It is also preferentially grazed by animals in young growth stage. It can be stacked, and can remain in good condition for about five years (Coldstream 1889).

Eragrostis ciliaris (L.) R. Br.

Vernacular name: Poongio.

Family: Poaceae

Habit: Annual tufted grass.

Habitat: Grows in abandoned fields.

Economic importance: It is grazed by animals in young growth stage.

Eragrostis minor Host

Vernacular name: Poongio.

Family: Poaceae

Habit: Annual tufted grass.

Habitat: It grows in abandoned fields.

Economic importance: It is grazed by animals.

Eragrostis tenella (L.) P. Beauv.

Vernacular name: Poongio.

Family: Poaceae

Habit: Annual grass.

Habitat: Grows in abandoned fields and gardens.

Economic importance: It is grazed by animals in rainy season.

Sporobolus diander (Retz.) P. Beauv.

Vernacular name: Gidder-ki-punchh.

Family: Poaceae

Habit: Annual grass.

Habitat: Grows in moist soils.

Economic importance: It is grazed by animals.

Lasiurus sindicus Henr.

Vernacular name: Sewan grass.

Family: Poaceae

Habit: Perennial, grass.

Habitat: Grows on sand dunes.

Economic importance: It is a highly nutritious grass of the Indian Desert. It grows fast and very high in a single fall of rain. It is grazed in young stage as it is very sweet, and get very hard when mature. It can be stacked for 10 years. Weavers make their brushes (Kunches) of the fibers of its roots. The seeds are mixed with bajra flour used as food in Bikaner. The elephants are fed on it (Coldstream 1889).

Panicum antidotale Retz.

Vernacular name: Garman.

Family: Poaceae

Habit: Tall, perennial grass.

Habitat: It grows in abandoned fields and wastelands.

Economic importance: It is grazed by animals when tender branches are there. It is an inferior nonplatable grass. Goats and camels are not known to graze it (Coldstream 1889).

Saccharum bengalense Retz.

Vernacular name: Sarkanda.

Family: Poaceae

Habit: Tall, tufted, perennial grass.

Habitat: Grows in moist soils near water channels and ponds.

Economic importance: It is used for roof thatching of houses in rural areas. The stem is used for making baskets. Leaf fibres are used for making cords and ropes.

Saccharum spontaneum Linn.

Vernacular name: Dharbi-ghas, Kans.

Family: Poaceae

Habit: Tufted, perennial grass.

Habitat: Moist soils near water bodies.

Economic importance: Leaves provide fibres. In tradtional medicine system, the whole plant is used for the treatment of several diseases. Roots are used to cure dyspepsia, piles, sexual weakness, gynecological and respiratiry diseases. Stem is used for haemorrhoids, dysentry, general debility. Leaves are used as cathartic and diuretic. This plant is used in the diseases of blood, biliousness and haemorragic diathesis (Mukhopadhyay and Ghosh 1993).

Setaria glauca (L) P. Beauv.

Vernacular name: Setaria.

Family: Poaceae

Habit: Annual grass.

Habitat: It grows along irrigation canals.

Economic importance: Used as fodder grass.

Setaria verticillata (Linn.) P. Beauv.

Vernacular name: Chirchita.

Family: Poaceae

Habit: Annual grass.

Habitat: Grows in fallow lands in moist fertile soils.

Economic importance: It is grazed by animals before flowering during rainy season.

Sorghum halepense Pers.

Vernacular name: Baru.

Family: Poaceae

Habit: Annual grass.

Habitat: Grows in fallow lands in moist fertile soils.

Economic importance: Seed used whole in a similar manner to rice or millet. The plant is a potential source of biomass. *Sorghum halepense* is a potential raw material that can be used for pulp and paper production (Albert *et. al.* 2011). It is grazed much and is relished as sweet. It can be stacked for five years. It is said to be poisonous if grazed when quite young (15-30 cm in height) and before the flowers have been developed, and when it is growing under drought conditions (Coldstream 1889).

Phoenix sylvestris (L.) Roxb.

Vernacular name: Khajoor.

Family: Arecaceae

Habit: Small tree.

Habitat: Grows in waste lands in this region.

Economic importance: The sap of this plant is used as a drink or beverages. It also provides ornaments, materials for shelter, fibres and fuel in the desert (Zaid 1999). The root is used for toothache, urinary disorders, digestive disorders and ulcers (Madhava 2005). The antiulcer properties of this plant have also been reported (Gandhimathi and Sreedevi 2012).

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Density (100 $^{m-2}$) of woody species at the main campus site of the Central University of Punjab.

Species	Study zones						
	I	II	III	IV	V	VI	Mean
Ephedra foliata	0	0	0	0	2.1	0	0.35
Acacia nilotica	0.2	1.1	1.4	0.3	0.3	1.4	0.78
Acacia tortilis	1.4	0.7	2.1	0.3	0	0.1	0.77
Azadirachta indica	0.2	1	0.1	0	1.1	0.9	0.55
Cocculus pendulus	0.2	0	0	0	5.9	0.2	1.03
Dalbergia sissoo	0.1	0	0.7	0.5	0.05	0.4	0.37
Eucalyptus globulus	0.6	0	0	0	0	0.1	0.03
Lycium barbarum	0.1	0	0	0	2.3	0.4	0.48
Melia azedarach	0.2	0.2	0.2	0	0	0.2	0.12
Prosipis chilensis	3.8	3.6	0.1	0	0.1	0.9	1.41
Prosopis cineraria	0.3	0	0	0.1	0.1	0.1	0.1
Salvadora oleoides	0.1	0	0	0	3.25	0.2	0.59
Tecomella undulata	0	0	0	0	0.05	0.2	0.04
Terminalia arjuna	0	0	0	0	0	0.2	0.03
Ziziphus jujuba	0.3	0	0	0	0	0	0.05
Ziziphus mauritiana	0	0.3	0	0	1.2	0.4	0.31
Ziziphus nummularia	0	0	0	0.1	1.3	0.6	0.33

Frequency (%) of woody species in main campus site of the Central University of Punjab.

Species	Study zones						
	I	II	III	IV	V	VI	Mean
Acacia nilotica	20	50	60	30	15	50	37.5
Acacia tortilis	50	30	70	10	0	10	28.33
Azadirachta indica	20	40	10	0	25	40	22.5
Cocculus pendulus	10	0	0	0	20	15	7.5
Dalbergia sissoo	30	0	20	40	5	40	22.5
Ephedra foliata	0	0	0	0	30	0	5
Eucalyptus globulus	10	0	0	0	0	10	3.33
Lycium barbarum	20	0	0	0	20	30	11.67
Melia azedarach	10	20	20	0	0	20	11.67
Prosipis chilensis	30	60	10	0	5	60	27.5
Prosopis cineraria	30	0	0	10	10	10	10
Salvadora oleoides	10	0	0	0	20	20	8.33
Tecomella undulata	0	10	0	0	5	20	5.83
Terminalia arjuna	0	0	0	0	0	10	1.67
Ziziphus jujuba	30	0	0	0	0	0	5
Ziziphus mauritiana	0	20	0	0	20	40	13.33
Ziziphus nummularia	0	0	0	10	15	40	10.83

Appendix II

Density (stems m^{-2}) of herbaceous species in the main campus site of the Central University of Punjab.

Species	Study zones						
	I	II	III	IV	V	VI	Mean
Abutilon indicum	0	0.2	0	0.2	0.7	0	0.18
Achyranthes aspera	0.15	0.2	2.2	0.7	0.3	0.6	0.75
Aerva persica	0.1	1.1	0	1.2	0.4	0.5	0.6
Aerva pseudotomentosa	0.42	0.7	0	0.42	0.2	0.2	0.3
Artemisia scoparia	9.7	6.1	1.6	7.6	0.2	2.3	4.6
Calotropis procera	4.2	1.7	1.3	2.5	0.5	1.3	2.4
Cenchrus biflorus	21.4	2.5	0	7	0	51	13.6
Cenchrus ciliaris	73.7	100	3.3	24.4	43	23	44.4
Cenchrus pennisetiformis	0	0	0.05	12.8	48	67	21.2
Cenchrus setigerus	113	1.8	4.2	0	8	3.5	21.7
Chenopdium ambrosoides	0.1	0.6	0	0.5	1.6	0	0.5
Citrullus colocynthis	0.5	0.2	0	0.05	0.4	0.3	0.2
Corchorus tridens	0	0	0.2	0.2	0	0.3	0.1
Crotalaria burhia	0.5	0.2	0	0.05	0	0.2	0.1
Croton bonplandianum	0	0	0.05	0.15	0.3	0.3	0.1
Cucumis melo var agrestis	0.25	0	0.15	0.15	0.1	0.5	0.2
Cynodon dactylon	585	107	44	540	60	250	264
Cyperus rotundus	0	88	49	538	70	0.2	124
Digitaria ciliaris	0.2	0	42	18.4	1.9	106	28
Echinops echinatus	0.35	0.2	0	0	0	0	0.1
Erigeron bonariensis	0.3	0	0	0.2	0.4	0	0.15
Erigeron canadensis	0	0.2	1160	2.15	0	0.1	193
Euphorbia hirta	0	0	0	0.7	0	0.5	0.2
Farsetia hamiltonii	0.5	0.1	0	0	0	0	0.1
Heliotropium bacciferum	2.9	0	0	0.05	5.5	0.3	1.45
Heliotropium strigosum	0.25	0	0	0	2.5	0	0.4
Ipomoea aquaqtica	0.15	0	1.5	0.1	0	0	0.3
Ipomoea pes-tigridis	0.05	0	0.1	0	0.2	0	0.05
Kochia indica	6.2	6.3	1.9	4.2	0.5	1.9	3.5
Momordica balsamina	0	0	0	0	2.6	0.4	0.49
Panicum antidotale	2.05	2	0.1	11.3	7.8	11	5.7
Parthenium hysterophorus	0	0	45.9	0	0	1	7.8
Peristrophe bicalyculata	0.2	0.2	0	0.2	0.9	0.2	0.3
Physalis peruviana	0	0.1	0.45	0.25	0.2	0.1	0.2
Saccharum bengalense	0	0	4.35	10.1	0	0	2.4
Sesbania bispinosa	0	0.3	14	7.9	0.6	0.2	3.8
Sida cordifolia	0.1	0	0	0.1	0.2	0.4	0.1
Solanum surattense	0.3	0	0	0.05	0.3	0.1	0.1
Verbesina encileoides	0.35	0.4	0.05	0.1	0.1	0.3	0.1
Xanthium strumarium	0.1	0	0	0.05	0	0.2	0.06

Frequency (%) of herbaceous species in the main campus site of the Central University of Punjab.

Species	Study zones						
	I	II	III	IV	V	VI	Mean
Abutilon indicum	0	20	0	20	30	0	11.7
Achyranthes aspera	15	15	55	25	25	35	28.3
Aerva persica	10	60	0	30	15	30	24.2
Aerva pseudotomentosa	70	40	0	40	10	50	35
Artemisia scoparia	30	30	30	50	15	30	30.8
Calotropis procera	40	40	80	70	20	70	53.3
Cenchrus biflorus	40	35	0	10	0	20	17.5
Cenchrus ciliaris	75	80	30	40	70	90	64.2
Cenchrus pennisetiformis	0	0	5	40	65	70	30
Cenchrus setigerus	40	20	30	0	10	5	17.5
Chenopdium ambrosoides	10	10	0	25	45	0	15
Citrullus colocynthis	50	15	0	5	35	10	19.2
Corchorus tridens	0	0	20	10	0	10	6.7
Crotalaria burhia	35	0	0	5	0	15	9.2
Croton bonplandianum	0	0	5	15	20	25	10.8
Cucumis melo var agrestis	25	0	5	15	10	25	13.3
Cynodon dactylon	20	35	20	25	15	45	26.7
Cyperus rotundus	0	25	5	25	20	5	13.3
Digitaria ciliaris	20	0	45	25	15	30	22.5
Echinops echinatus	35	20	0	0	0	0	9.2
Erigeron bonariensis	5	0	0	15	25	0	7.5
Erigeron canadensis	0	15	30	15	0	5	10.8
Euphorbia hirta	0	0	0	35	0	5	6.7
Farsetia hamiltonii	25	10	0	0	0	0	5.8
Heliotropium bacciferum	20	0	0	5	40	25	15
Heliotropium strigosum	25	0	0	0	10	0	5.8
Ipomoea aquaqtica	15	0	35	10	0	0	10
Ipomoea pes-tigridis	5	0	10	15	15	0	7.5
Kochia indica	30	70	30	70	30	40	45
Momordica balsamina	0	0	0	0	60	20	13.3
Panicum antidotale	20	10	5	40	40	25	23.3
Parthenium hysterophorus	0	0	80	0	0	25	17.5
Peristrophe bicalyculata	15	35	0	20	40	20	21.7
Physalis peruviana	0	10	35	25	20	10	16.7
Saccharum bengalense	0	0	15	10	0	0	4.2
Sesbania bispinosa	0	15	70	40	25	20	28.3
Sida cordifolia	10	0	0	10	15	25	10
Solanum surattense	30	0	0	5	10	5	8.3
Verbesina encelioides	35	30	5	10	5	15	16.7
Xanthium strumarium	10	0	0	5	0	15	5

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Central University of Punjab
Main Campus Site




Botanical survey carried out by
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