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Research Article

## Ethnobotanical Profiling and Floristic Diversity of the Miyawaki Plantation in Saurashtra University Campus, Rajkot

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### Abstract

The investigation was carried out in order to explore the existing floristic composition of the Miyawaki plantation, recently developed in the Saurashtra University campus, Rajkot. The main aspect of the study is to prepare an ethnobotanical and pharmacological inventory of the recorded plant species from the study area. The fieldwork was conducted for a period of four months regularly in the study area. This study revealed that most of the species as documented are total 71 plant species belonging to 62 genera and 32 families, could be used for the various medicinal purposes from Miyawaki plantation. Present investigation provides a huge lump of ethnobotanical significance and it is an urgent need to document uses of plants for future domestication.

**Keywords:** Miyawaki, Ethnobotany, Plantation, Floristic diversity, Medicinal plants

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## INTRODUCTION

Miyawaki plantation method can be simply defined as the random and dense plantation of native plant species of the particular region. This innovative restoration methodology has been extremely successful across the globe to restore the patches of mini forest or pocket forest even in the urban environments. Miyawaki method promotes the process of restoration by planting a dense combination of late and intermediate successional plant species selected on the basis of regional vegetation survey. Native trees of the mini forests grow vigorously, and it is ten times faster and absorbs thirty times more carbon dioxide than those of the natural forest. The technique is introduced by the Japanese botanist Dr. Akira Miyawaki for the development of forest which has several functions but the most important functions are restoration of green environment and ecotechnological (vegetation-ecological approach) reforestation.<sup>1-6</sup>

Vegetation plays key role in the urban environment by supporting several fundamental subsystems like atmospheric gas balance, biogeochemical cycle, hydrological cycle, climate in the surrounding and others, therefore the development of green area helps to improve the urban environmental conditions. The quality of vegetation in any ecosystem is one of the best indicators of their environmental condition. In addition, the plants have been used for food and medicine since the beginning of human civilization. Use of plants as a source of medicine has been inherited and is an important component of the health care

system. Considering the above, the main aim of the present study was to list the plant species present in the Miyawaki plantation at Saurashtra university campus and reveals their medicinal significance.

## METHODOLOGY

Field surveys were conducted continuously during the year 2020-2021 to document the floristic diversity in Miyawaki plantation at Saurashtra University campus, Rajkot. Miyawaki method is the random and dense plantation of the native species. A survey of the vegetation was made and observed different plants such as herbs, shrubs and trees. The identification of plant species during field work was done by using the Flora of Gujarat State<sup>7</sup>, Flora of Presidency of Bombay<sup>8</sup> and other standard books as well as authenticated by experts. For documentation, the photographs were also taken for selected plant species during the field work. The genera in a family and species in genus are arranged alphabetically. Authenticate literatures were referred to know the ethnobotanical as well as pharmacological significance of the recorded plant species. The plant species includes botanical name, family, common name, vernacular name, life form and medicinal uses.

## RESULTS AND DISCUSSION

List of the plants species recorded in the Miyawaki plantation at Saurashtra University campus are shown along with the botanical information and medicinal uses in Table 1. Floristic enumeration of species in the study area reveals a

total of 71 species belongs to 62 genera and 32 families (Table 1 & 2). Analysis of the life form shows that trees predominate with 49 species (69%) followed by shrubs with 15 species (21%), herbs with 6 species (9%) and 1 species of grass (1%) as shown in Figure 1. Of the 32 families found, the first nine families contributing 40 species. Of these Caesalpiniaceae is the most dominant family, comprising 7 species, followed by Apocynaceae 6 spp., Mimosaceae 5 spp., and Moraceae 5 spp. (Table 2). The family Combretaceae and Rutaceae are representing 4 species each. Three families are represented by 3 species each, they are Myrtaceae, Papilionaceae and Verbinaceae. The family Acanthaceae, Bignoniaceae, Boraginaceae, Euphorbiaceae, Lamiaceae, Malvaceae, Meliaceae and Sapotaceae are represented by 2 species each and 15 families are only represented by a single species namely Amaranthaceae, Anacardiaceae, Annonaceae, Arecaceae, Bombacaceae, Capparaceae, Crassulaceae, Lythraceae, Moringaceae, Muntingiaceae, Oleaceae, Poaceae, Salvadoraceae, Simaroubaceae and Solanaceae (Table 2). Out of 62 genera *Ficus* and *Terminalia* are dominant genera.

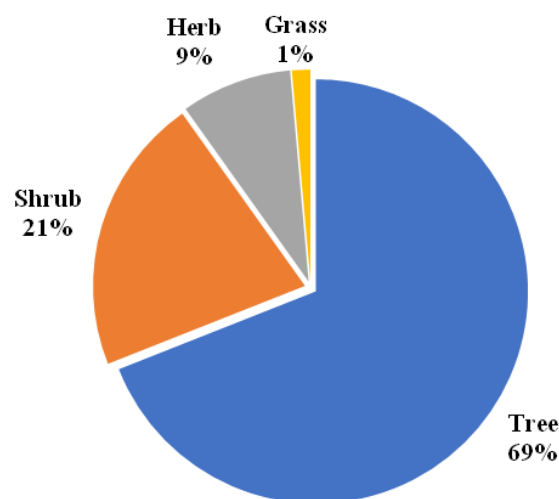


Figure 1: Number of plant form recorded in study area

Table: 1 Information of plant species recorded in study area.

No.	Botanical name	Family	Common name	Vernacular name	Life form	Significance (Ethnobotanical & Pharmacological) <sup>9,10</sup>
1	<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Mimosaceae	Ear leaf acacia	Australian baval	Tree	Extracts of heartwood inhibit fungi that attack on wood. Used to make an analgesic by indigenous Australians.
2	<i>Aegle marmelos</i> (L.) Correa	Rutaceae	Wood apple	Bili	Tree	Root; fever, abdominal pain, heart palpitations, urinary troubles, hypochondriasis, melancholia. Decoction of Root bark; intermittent fever and as a constituent in dasamul (ten roots). Leaves; ophthalmia, deafness, inflammations. Fresh juice of leaves; catarrhs and feverishness, eye affections. Flowers; allaying thirst and vomiting, dysentery. Unripe fruit, pain, chronic diarrhoea and dysentery. Ripe fruit; causes biliousness, cough, heart troubles, nervous troubles, dypepsia.
3	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Indian tree of heaven	Arduso	Tree	Dyspepsia, bronchitis, dysentery, diarrhoea, earache, skin diseases, rectum troubles, allays thirst, removing bad taste of mouth as tonic.
4	<i>Albizia lebeck</i> (L.) Benth.	Mimosaceae	Frywood	Shirish	Tree	Bark: blood diseases, bronchitis, leprosy, paralysis, leucoderma, itching, skin diseases, weakness piles, excessive perspiration, inflammation, syphilis, erysipelas, rat-bite, tooth-ache, boils, scabies. Leaves: asthma, snake-bite, smell of flower, hemicrania. Seeds: gonorrhoea, buberculous glands, piles, diarrhoea. Seed oil: leucoderma, leprosy. Gum: inflammation.
5	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Devil's tree	Saptaparni	Tree	Bark: heart diseases, asthma, leucoderma, chronic blood diseases, pains, diarrhoea, advanced stage of dysentery, leprosy, chronic paludism with enlargement of spleen, liver complaints. Milky juice: ulcers, earache. Tender leaves: in beri-beri, dropsy, congested liver, roasted, pulverised and made into poultices, acts as local stimulant to unhealthy ulcers, latex applied to ulcers, tumors and rheumatic

						swelling. Flowers yielding essential oil and alkaloid picrinine, acts as depressent on central nervous system. Ash of the plant is caustic, and is used to open abscesses.
6	<i>Alternanthera dentata</i> (Moench) Stuchlk ex R. E. Fr.	Amaranthaceae	Little ruby	Lalmendi	Herb	Used as an antiviral and anti-diarrhoea agent.
7	<i>Annona squamosa</i> L.	Annonaceae	Custard apple	Sitafal	Tree	Fruit: enriching blood, increasing muscular strength, burning sensation, lessening tendency to biliousness, retrieving vomiting. Seeds: difficult to digest, causes fever and furunculosis, produces ulcers in eyes, destroys lice. Root: dysentery, depression of spirits and spinal diseases. Crushed leaf: tympany, bloat, foot and mouth diseases, dewormer, dressing on wound with maggots. Leaf juice: in broken horn.
8	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Limbo	Tree	Bark, vomiting, burning sensation near the heart, fatigue, fever, thirst, bad taste in the mouth, cough, cures ulcers, inflammations, leprosy, blood complaints, urinary discharges, also causes loss of appetite. Leaf; Ophthalmia, biliousness, skin diseases, lessening inflammation, earache, rheumatism, syphilitic sores, boils, blood impurities. Decoction of leaf, Used as a gargle in stomatitis and for bad gums. Tender young leaves; eye and skin diseases, leprosy. Old leaves; in curing ulcers quickly. Young branches; cough, asthma, piles, tumours, urinary discharges. Ripe and unripe fruits; urinary discharges, skin diseases, tumours, piles, toothache. Oil of the seed is used to cure skin diseases.
9	<i>Bambusa bambos</i> (L.) Voss	Poaceae	Bamboo	Vansh	Grass	Leaves against menstrual pain and worms, and to strengthen stomach function. Root is used for general debility and joint pain and the plant juice for osteoarthritis and osteoporosis.
10	<i>Bauhinia variegata</i> (L.) Benth.	Caesalpiniaceae	Orchid tree	Kanchnar	Tree	Bark: Astringent in diarrhoea, root is carminative and flowers are laxative and anthelmintic. Decoction of bark is recommended as useful in ulcers. Bark, root and flowers mixed with-rice water are used for boils and abscesses. Paste made of the bark together with dried ginger is also applied to scrofulous tumours. Flowers with sugar are gentle laxative. The plant is used in malaria and is also used as an antidote in snake-bite.
11	<i>Butea monosperma</i> (Lam.) Taub.	Papilionaceae	Flame of the forest	Khakhro	Tree	Leaves and flowers: tonic, astringent, aphrodisiac, depurgative, diuretic. Leaf used in eye diseases, in lessening inflammation and lumbago, curing boils and piles. Bark: fractures of bones, anus diseases, piles, dysentery, ulcers and tumours, lessen inflammation biliousness and dysmenorrhoea, liver disorders, gonorrhoea, purifying blood, acrid, bitter, oily, appetiser, aphrodisiac, laxative, anthelmintic. Flowers: cough,

						leprosy, strangury, skin diseases, thirst, burning sensation, biliousness, inflammation, burning urine, gonorrhoea. Juice of Flower: eye diseases, sweet, bitter, acrid, hot expectorant, emmenagogue. Fruit and seed: urinary discharges, piles, skin diseases, tumours, abdominal troubles, scorpion-sting, eye diseases hot, dry, digestible, anthelmintic, aperient, bitter oily leaf: carminative, anthelmintic. Gum: dysentery, stomatitis, cough, pterygium, corneal opacities, curing excessive perspiration, liver tonic, chest and lung diseases, astringent, aphrodisiac. Root, curing night blindness and other defects of sight, elephantiasis.
12	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Caesalpinaceae	Peacock flower	Galtoro	Shrub	Flowers: bronchitis, asthma, malarial fevers. Plant: ulcers, tumours, root and bulbs: cholera.
13	<i>Carissa carandas</i> (L.) Auct.	Apocynaceae	Christ's thorn	Karamda	Shrub	Fruit: sour, thirst, blood impurities, brain diseases, diminishes sexual power. Causes biliousness.
14	<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	Yellow oleander	Pili Karen	Tree	Plant is bitter, pungent, acrid, hot, and astringent. The bark is bitter and cathartic, febrifuge. The milky juice of the tree is poisonous. The leaves are purgative and emetic. The seeds are abortifacient, alexiteric and purgative. The plant is useful in bowels, urethral discharges, worms, skin diseases, Leucoderma, wounds, piles, eye troubles, itching, fevers, bronchitis and cures "vata". The bark is useful in various kinds of intermittent fevers. The roots are made into a plaster and applied to tumors.
15	<i>Cassia fistula</i> L.	Caesalpinaceae	Golden shower tree	Garmalo	Tree	Pustules, rheumatism, fever, heart-diseases, retained excretions, bronchitis, biliousness, ringworm.
16	<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Periwinkle	Barmasi	Herb	Decoction of dried plant, boiled in oil is rubbed in joint regions in cases of lumbago. Leaf infusion is administered in menorrhagia, applied in wasp sting. Leaves are used in diabetes. Leaves kept in water in night and the water drunk in the morning, bring down the sugar level to normal.
17	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	Kapok tree	Shimlo	Tree	Used in dysentery, anemia, inflammatory, dropsical affection, hepatic disorder, rheumatic and gouty complaints, Kala-azar, chronic peritoneal conditions, heart diseases and kidney ailments. The root juice is used in diabetes.
18	<i>Cestrum nocturnum</i> L.	Solanaceae	Night blooming jasmine	Raat rani	Shrub	Decoctions of the dried leaves were not effective against pharmacologically induced convulsions, but repeated administration reduced the amplitude of epileptic spikes in both primary and secondary foci. Results suggest the plant possesses analgesic activity through a peripheral mechanism. An extract of the plant is used as an antispasmodic and as a treatment for epilepsy. In laboratory

						tests, extracts of the plant were shown to inhibit tumor growth and prolong the lifetime in a dose-dependent manner.
19	<i>Citrus limon</i> (L.) Osbeck	Rutaceae	Lemon	Limbu	Tree	Used mainly for culinary purposes and in the preparation of beverages. Oil of Lemon, used as carminative and for flavouring liqueurs. Lemon juice is very useful for scurvy. Fruit in the form of pickle useful in hypertrophy of spleen.
20	<i>Coleus amboinicus</i> (Lour.) Spreng	Lamiaceae	Cuban oregano	Ajma	Herb	Used for the treatment of coughs, sore throats and nasal congestion, also for a range of other problems such as infections, rheumatism and flatulence
21	<i>Cordia dichotoma</i> G.Forst.	Boraginaceae	Indian cherry	Gundo	Tree	Dyspepsia, fever, Kernels: ring worms. Leaf: ulcers, prolapse of uterus/vagina and headache. Fruit: affection of Urinary passages, diseases of lungs and spleen. Plant: snakebite. Fruit: spleen and lungs diseases, dry cough, chest and urethral diseases, Chronic fever, lessening thirst, scalding of urine, bad humours, joint pains, throat burning.
22	<i>Cordia sinensis</i> Lam.	Boraginaceae	Grey-leaved saucer berry	Gundi	Tree	Decoction of the root and bark is used to treat stomach disorders. Roots are boiled and the decoction used for the treatment of malaria. The roots are used to induce abortion. Bark is astringent and is used to prepare a gargle. The leaves are used alone or in mixture with other medicinal plants as a treatment against fever.
23	<i>Crateva magna</i> (Lour.) DC	Capparaceae	Large garlic pear	Vayarno	Tree	The fresh leaves are rubefacient and tonic. They are applied as a tonic and skin irritant against high fever. The bark and roots are generally used against various female disorders or as a tonic. The root bark is used to treat urolithiasis. The juice from the bitter stem or root bark is used in decoction for stimulating the appetite or as a digestive, as a laxative against colic and as a febrifuge.
24	<i>Dalbergia sissoo</i> Roxb.	Papilionaceae	Indian rosewood	Sisum	Tree	The roots are astringent and constipating. The leaves are bitter, stypic, ophthalmic, digestive, constipating anthelmintic, diuretic and stimulant. The heartwood is astringent, abortifacient, anthelmintic, vulnerary, anti-inflammatory, aphrodisiac, emmenagogue, antipyretic, depurative and appetiser. The roots are useful in diarrhoea and dysentery. The leaves are useful in gonorrhoea, menorrhoea, excoriation, ophthalmopathy, dyspepsia, colic, diarrhoea, dysentery, vomiting, haemorrhoids and burning sensation. The bark and heartwood are useful in hyperdipsia, burning sensation, vomiting, skin diseases, leprosy, leucoderma, scabies, ulcers, dyspepsia, dysentery, scalding of urine, syphilis, gastropathy, helminthiasis, ophthalmopathy. Amenorrhoea, dysmenorrhoea, hiccough, bronchitis, sciatica, gout, inflammations, intermittent fevers and vitiated conditions of vata.
25	<i>Duranta erecta</i> L.	Verbinaceae	Golden dew	Damyanti	Shrub	The plant is used in the treatment of

			drops			fevers, skin itches. The plant is used as an insect repellent.
26	<i>Euphorbia tithymaloides</i> L.	Euphorbiaceae	Lady's slipper flower plant	Vilati Kharsani	Shrub	Root powerful emetic, used in west Indies under the name Ipecacuanha. Latex enetic, and caustic, used in venereal diseases; also applied to warts and leucoderma patches.
27	<i>Ficus amplissima</i> Rees.	Moraceae	Indian bat fig	Pipar	Tree	Bark is used as a natural anti-diabetic and anti-oxidant medicine, reducing blood glucose levels.
28	<i>Ficus benghalensis</i> L.	Moraceae	Banyan	Vad	Tree	Plant: biliousness, ulcers, erysipelas, vaginal complaints, fever, inflammations, Vomiting, leucorrhoea. Root: gonorrhoea, syphilis, biliousness, dysentery, inflammations of liver. Root fibers: gonorrhoea, obstinate vomiting, diabetes, and haemoptysis. Bark: Burning sensation, haemoptysis, haemorrhages, diarrhoea, dysentery, diabetes, enuresis, ulcers, skin diseases, gonorrhoea, leucorrhoea, hyperdipsia. Leaves: Ulcers, Leprosy, allergic conditions of the skin, buming sensation, abscesses. Buds: Diarrhoea, dysentery. Milky juice: lessens inflammations, piles, gonorrhoea, and diseases of nose. Externally applied for pains and bruises and in rheumatism and lumbago, applied to soles of the feet when cracked or inflamed, also applied to teeth and gums as a remedy for toothache. Fruits: Refrigerant, tonic, pitta. Latex: Neuralgia, rheumatism, lumbago, bruises nastis, ulorrhagia, ulitis, odontopathy, haemorrhoids, gonorrhoea, inflammations, cracks of the sole and skin diseases.
29	<i>Ficus racemosa</i> L.	Moraceae	Cluster fig	Umro	Tree	Bark: Abortions. Leaves: Pitta, ulcers. Tender fruits: pitta, diarrhoea, dyspepsia, and hemorrhages. Ripe fruits: Menorrhagia, haemoptysis. Latex: aphrodisiac, haemorrhoids, diarrhoea.
30	<i>Ficus religiosa</i> L.	Moraceae	Sacred fig	Piplo	Tree	Plant parts: diseases of blood, vagina, uterus, and leucorrhoea, burning sensation, Gonorrhoea, Diarrhoea, dysentery, haemorrhoids, gastrohelcosis. Fruit: vomiting, digestion. Ripe fruit: burning sensation, foul taste, biliousness, blood and heart. Dried fruit: pulverized asthma, fruitfulness in women. Root: gout. Root bark: stomatitis, ulcers, leucorrhoea, granulations, and lumbago. Young root bark: bone fracture. Powdered root bark: absorbent in inflammatory swellings. Old leaves: soaked in water stops vomiting. Bark: Inflammatory swellings, burns. Leaves and tender shoots: wounds, skin diseases. Dried fruits: Asthma. Latex: Neuralgia, inflammations and hemorrhages.
31	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Shoe flower	Jasud	Shrub	Buds: burning sensation, urinary discharge, seminal weaknesses, piles, uterine and vaginal discharge, promote growth of foetus, cause vomiting and intestinal worms. Roots: Cough, venereal

						diseases, gonorrhoea, menorrhagia, pruritus and fever. Leaves: Burning sensation, hepatopathy, fatigue, abscesses, expulsion of the placenta, skin diseases, fever, constipation, pruritus. Flowers: Kapha and pitta, boils, inflammations, epilepsy, cerebropathy, dysentery, haemorrhoids, urethrorrhoea, diabetes, bronchitis, emmenagoguge, cardiac debility, haemoptysis, menorrhagia, seminal weakness, skin diseases, leprosy and pruritus.
32	<i>Jasminum sambac</i> (L.) Sol	Oleaceae	Jui	Mogro	Shrub	The leaves and flowers are considered valuable as a lactifuge. Dried leaves soaked in water and made into poultice are used in indolent ulcers.
33	<i>Justicia adhatoda</i> L.	Acanthaceae	Malabar nut	Ardusi	Shrub	Plant: bronchitis, leprosy, blood impurities, heart troubles, thirst, asthma, fever, vomiting, loss of memory, leucoderma, consumption, jaundice, tumours, diseases of mouth. Root: facilitates the expulsion of foetus, strangury, leucorrhoea with blood discharges bronchitis, asthma, bilious vomiting, sore eyes, fevers, gonorrhoea. Leaves: gonorrhoea. Flowers: improving blood circulation, lessen strangury, jaundice. Fruit: bronchitis. Leaves and Roots: for all sorts of cough. Juice of leaves diarrhoea, dysentery. Fresh flower: Ophthalmia. Root: powder: malarial fever, treatment of cold and cough, asthma, phthisis, diphtheria.
34	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Life plant	Pannfuti	Herb	Vitiated conditions of pitta and vata, haematemeses. haemorrhoids, menorrhagia, cuts and wounds, discolourisations of the skin, boils, sloughing, ulcers, ophthalmia, burns, scalds, corn, diarrhoea dysentery, vomiting, acute inflammations.
35	<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Wild tamarind	Liso baval	Tree	A decoction of the root and bark is abortifacient. The roasted seeds are emollient.
36	<i>Limonia acidissima</i> L.	Rutaceae	Wood apple	Kothu	Tree	Leaves are carminative, and astringent, yield an essential oil. Fruits are tonic, antiscorbutic, alexipharmic. Fruits are used in constipation.
37	<i>Mangifera indica</i> L.	Anacardiaceae	Mango	Keri	Tree	Root and bark: Pitta, metrorrhagia, colonorrhagia, Pneumorrhagia, leucorrhoea, syphilis, wounds, ulcers, vomiting, uteritis, diarrhoea, dysentery, diphtheria, rheumatism. Leaves: Kapha and pitta, hiccough, hyperdipsia, burning sensation, haemorrhages, haemoptysis, haemorrhoids, wounds, ulcers, diarrhoea, dysentery, pharyngopathy, stomatopathy. Ash of burnt leaves: burns and scalds. Flowers: Pitta, haemorrhoids, haemoptysis, haemorrhages, wounds, ulcers, anorexia. Unripe fruit: Gastropathy, dyspepsia, pharyngopathy, ulcers, dysentery, urethrorrhoea, vaginopathy. Ripe fruit: Vata and pitta, anorexia, dyspepsia, cardiopathy, haemoptysis, haemorrhages, emaciation, anaemia, debility. Seed kernel: diarrhoea,

						dysentery, haemorrhoids, haemorrhages, haemoptysis, ulcers, bruises, leucorrhoea, menorrhagia, diabetes, heartburn, vomiting. Leaves, bark, stem and unripe fruit shows antibacterial activity.
38	<i>Manilkara hexandra</i> (Roxb.) Dubard	Sapotaceae	Ceylon iron wood	Rayan	Tree	The fruit is oleaginous, cooling, indigestible, tonic, aphrodisiac. The fruit is good for heart and cures biliousness, useful in leprosy. The seeds cure ulcers and opacities in the cornea.
39	<i>Melia azedarach</i> L.	Meliaceae	Chinaberry tree	Bakan limdo	Tree	The roots are acrid, bitter, astringent, mildly heating, anodyne, depurative, vulnerary, anti-septic, anthelmintic, constipating, expectorant, febrifuge, anti-periodic, urinary astringent, emmenagogue and tonic. The leaves are bitter, astringent, expectorant, vermifuge, antilithic, diuretic, emmenagogue and stomachic. The seeds are bitter, expectorant, anthelmintic, aphrodisiac. The flowers are astringent, refrigerant, anodyne, stomachic, Vermifuge, diuretic, emmenagogue, deobstruant and alexipharmic. The seed oil is laxative, anthelmintic, depurative, maturant and tonic. The roots are useful in vitiated conditions of diseases, vata, sciatica, skin helminthiasis especially tapeworm, asthma, Amenorrhoea, dysmenorrhoea, chronic and intermittent fever, burning sensation and general debility. In excessive dose it is emetic and purgative. The leaves are useful in hysteria, leprosy, splenomegaly, cough, bronchitis and scabies. The seeds are useful in helminthiasis, typhoid fever, pain in pelvic region. The flowers are useful in cephalalgia, gastropathy, verminosis, strangury and fever. The seed oil is useful in hepatopathy, leprosy, otalgia, splenomegaly and dermatopathy.
40	<i>Mimusops elengi</i> L.	Sapotaceae	Spanish cherry	Borsali	Tree	Bark: used as a gargle for odontopathy, ulitis, ulemorrhagia. Tender stems: tooth brushes, cystorrhoea, diarrhoea, dysentery. Flowers: lotion for wound and ulcers, cephalalgia. Seeds: Constipation.
41	<i>Moringa oleifera</i> Lam.	Moringaceae	Drumstick	Saragavo	Tree	Vata and kapha, dyspepsia, anorexia, verminosis, diarrhoea, colic, flatulence, otalgia, paralysis, inflammations, amenorrhoea, dysmenorrhoea, fever, strangury, vesical and renal calculi, ascites, ophamapathy, cough, asthma, bronchitis, pectoral diseases, splenomegaly, epilepsy, hysteria, cardiopathy, abscess, pharyngodynia. Bark: ascites, vitiated conditions of vata and kapha, ringworm. Leaves: Scurvy, vata and kapha, wounds, tumours, inflammations, antihelminthis. Seeds: neuralgia, inflammations, intermitter fever, ophamology.
42	<i>Morus alba</i> L.	Moraceae	Mulberry	Shetur	Shrub	Fruit is useful for sore throat, dyspepsia and melancholia. Root bark used in nervous disorders.



43	<i>Muntingia calabura</i> L.	Muntingiaceae	Bird cherry	Jamaikan cherry	Tree	Infusion of the flowers is valued as an antispasmodic. It is taken to relieve headache. Flowers are said to possess antiseptic properties.
44	<i>Murraya koenigii</i> (L.) Sprg.	Rutaceae	Curry leaf plant	Mitho Limbdo	Shrub	The leaves and roots cure piles allay heat of the body, thirst inflammation, itching and useful in leucoderma and blood disorders. Barks and roots are used to cure eruptions and the bite of poisonous animals. The green leaves are eaten raw for the cure of dysentery; infusion is used to stop vomiting. Juice of the rood is good for the pain associated with kidney. The fruit is useful in diarrhoea and dysentery.
45	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Holy basil	Tulsi	Herb	The juice of leaves possesses diaphoretic, antiperiodic, stimulating and expectorant properties. Used in catarrh and bronchitis, applied to the skin, in ringworm and other cutaneous diseases and dropped into the ear to relieve earache. An infusion of the leaves is used as a stomachic in gastric disorders of children. A decoction of the root is given as a diaphoretic in malarial fevers. The seeds are mucilaginous and demulcent, and are given in disorders of genitourinary systems
46	<i>Peltophorum pterocarpum</i> (DC.) K. Heyne	Caesalpiniaceae	Copperpod	Tamraparni	Tree	Different parts of this tree are used to treat many diseases like stomatitis, insomnia, skin troubles and constipation. The traditional healers use the leaves in the form of decoction for treating skin disorders. Bark is used as medicine for dysentery, as eye lotion, embrocation for pains and sores. Stem infusion used in dysentery, for gargles, tooth powder and muscular pain. Flowers are used as an astringent to cure or relieve intestinal disorders after pain at childbirth, sprains, bruises and swelling or as a lotion for eye troubles, muscular pains and sores.
47	<i>Phoenix dactylifera</i> L.	Areaceae	Date palm	Khajuri	Tree	Fruits are edible, considered restorative olcaginous, cardiotoxic, fattening, abdominal constipating, aphrodisiac, good in heart complaints, vomiting, wandering of mind, Loss of consciousness. The central tender part is used in gonorrhoea and gleet. The root is used in tooth ache.
48	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Indian goose berry	Amla	Tree	Root bark is useful in ulcerative stomatitis, gastrohelicosis. The leaves are useful in conjunctivitis, inflammations, dyspepsia, diarrhoea and dysentery. The fruits are useful in vitiated conditions of tridosha, diabetes, cough, asthma, bronchitis, cephalgia, ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcer, erysipelas, skin diseases, leprosy, haematemesi, inflammations, anaemia, emaciation, hepatopathy, jaundice, strangury, diarrhoea, dysentery, haemorrhages, leucorrhoea, menorrhagia, cardiac disorders, intermittent fever and greyness of hair.

49	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Manilla tamarind	Goras ambli	Tree	A paste made from the leaves is applied externally to treat muscular swellings caused by some inflammations. Bark of the root is a good remedy for diarrhoea and dysentery. The bark is used medicinally as a febrifuge. The fruit pulp is taken orally to stop blood flow in case of haemoptysis. The seed juice is inhaled into the nostrils against chest congestion and pulverised seeds are ingested for internal ulcers.
50	<i>Plumeria rubra</i> L.	Apocynaceae	White frangipani	Champo	Tree	Root Bark: Ulcers, Pruritus, leprosy, gastropathy. vata and kapha. Leaves: inflammations. Milky juice: rubefacient in rheumatism.
51	<i>Pongamia pinnata</i> (L.) Pierre	Papilionaceae	Indian beech tree	Karanj	Tree	Seeds oil is useful in skin diseases, eczema. Root is used for treating gonorrhoea, cleaning gums, teeth, and ulcers, and is also used in vaginal and skin diseases.
52	<i>Prosopis cineraria</i> (L.) Druce	Mimosaceae	Ghaf	Khijado	Tree	The plant is reported to be astringent, demulcent, and pectora. The flowers are pounded, mixed with sugar and eaten during pregnancy as a safeguard against miscarriage. The ashes of the plant are rubbed over the skin to remove hair. The bark is considered to be anthelmintic, refrigerant, and tonic. It is used for treating asthma, bronchitis, dysentery, leucoderma, leprosy, rheumatism, scorpion stings, muscle tremors, piles, and wandering of the mind. Smoke from the leaves is suggested for eye troubles. The seedpod is said to be astringent.
53	<i>Psidium guajava</i> L.	Myrtaceae	Guava	Jamphal	Tree	Roots: haemorrhages, diarrhoea, dysentery, ulcers, gingivitis, proctoptosis, vomiting. Leaves: Wounds, ulcers, cholera, diarrhoea, vomiting, nephritis, cachexia, vata, epilepsy, odontalgia, gum boils. Flowers: bronchitis, ophthalmodynia, colic, ulemorrhagia. Fruits: Pitta, dipsia, burning sensation, colic, ulemorrhagia, diarrhoea, dysentery, debility.
54	<i>Punica granatum</i> L.	Lythraceae	Pomegranate	Dadam	Shrub	Root and stem bark: Tapeworm infection, vomiting. Flowers: Vomiting, pitta, ophthalmodynia, ulcers, pharyngodynia, hydrocele. Fruits: Anaemia, hyperdipsia, pharyngodynia, ophthalmodynia, pectoral diseases, splenopathy, bronchitis, otalgia. Fruit rind: dysentery. diarthoea, and gastralgia. Seeds: vomiting, ophthalmodynia, pitta, scabies, hepatopathy, splenopathy.
55	<i>Ruellia tuberosa</i> L.	Acanthaceae	Snapdragon root	Fatakadi	Herb	Used for the treatment of stones in the bladder. A decoction of the leaves is given in chronic bronchitis
56	<i>Salvadora persica</i> L.	Salvadoraceae	Meswak	Piludi	Tree	The root bark is used to relieve splenalgia. The stem bark is useful in asthma, bronchitis, and cough, vitiated condition of vata, strangury, painful tumors, scurvy, constipation, verminosis and haemorrhoids. The shoots and leaves are useful in all types of poisons, cough

						and bronchitis. The fruits are stomachic, purgative and digestive. Tender twigs are used as toothbrush.
57	<i>Senna auriculata</i> (L.) Roxb.	Caesalpiniaceae	Matura tea tree	Aval	Shrub	The root is used in decoctions against fevers, diabetes, diseases of urinary system and constipation. The leaves have laxative properties. The dried flowers and flower buds are used as a substitute for tea in case of diabetes patients. The seeds are used in ophthalmia.
58	<i>Senna siamea</i> (Lam.) Irwin et Barneby	Caesalpiniaceae	Kassod tree	Kasheed	Tree	Fruit is used to charm away intestinal worms and to prevent convulsions in children. The heartwood is said to be a laxative, and a decoction is used against scabies.
59	<i>Syzygium cumini</i> (L.) Skeels.	Myrtaceae	Black plum	Jamboo	Tree	The bark is useful in diabetes, leucorrhoea, stomachalgia, fever, gastropathy, strangury and dermatopathy. The tender leaves are used for vomiting. The leaves are used for strengthening the teeth and gums. The fruits and seeds are used in diabetes, diarrhoea, pharyngitis, splenopathy, urethrorrhoea and ring worm.
60	<i>Syzygium jambos</i> L. (Alston)	Myrtaceae	Rose apple	Gulab jamboo	Tree	The bark is astringent, bitter, sweet, haemostatic, depurative, vulnerary, anti diarrhoeal and anthelmintic. The fruits sweet and aromatic and are edible. Bark is useful in gout, haemorrhages, syphilis, leprosy, dermatopathy, diarrhoea, colic, helminthiasis, wound, ulcers, stomatitis and vitiated conditions of 'pitta'.
61	<i>Tabernaemontana divaricata</i> R.Br. ex Roem. & Schult.	Apocynaceae	Crape jasmine	Tagar	Shrub	Crude extract used against infectious diseases such as syphilis, leprosy, and gonorrhoea, as well as its antiparasitic action against worms, dysentery, diarrhoea, and malaria.
62	<i>Tamarindus indica</i> L.	Caesalpiniaceae	Tamarind tree	Ambli	Tree	The root bark is useful in diarrhoea, asthma, Amenorrhoea, gingivitis and ulcers. The leaves are useful in vitiated conditions of vata, swellings, fever, scalding of urine, gastropathy. helminthiasis, wounds, ulcers, jaundice, scabies, tumours, ringworms, boils, small pox, otalgia and conjunctivitis. The fruits are useful in gastropathy, bilious vomiting, datura poisoning, alcoholic intoxication, dyspsia, scabies, pharyngitis, poisoning, stomatitis, constipation, haemorrhoids, ophthalmopathy. The seeds are useful in stomachalgia, diarrhoea, dysentery, dipsia, burning sensation, haematuria, giddiness, vertigo, hepatopathy, inflammations, chronic ulcers, abscess, haemorrhoids, vaginopathy, metroptosis, diabetes and general debility.
63	<i>Tecoma stans</i> (L.) Juss. ex Kunth	Bignoniaceae	Yellow trumpet	Pili vasant	Shrub	Used for treatment of diabetes, digestive problems, control of yeast infections, as powerful diuretic, vermifuge and tonic.
64	<i>Tecomella undulata</i> (Sm) Seem	Bignoniaceae	Desert teak	Ragatrohido	Tree	The bark is used for syphilis. Bark given internally on broken bones.

65	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	Arjun tree	Arjun sadad	Tree	It is useful in fractures, ulcers, urethrorrhoea, leucorrhoea, diabetes, vitiated conditions of pitta, anaemia, cardiopathy, hyperhidrosis, fatigue, asthma, bronchitis, tumours, otalgia, inflammations, dysentery, internal and external haemorrhages and hypotension.
66	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Belleric myrobalan	Baheda	Tree	The bark is useful in leucoderma. The fruits are useful in vitiated conditions of vata and pitta, cough, bronchitis, pharyngitis, insomnia, dropsy, dyspepsia, flatulence, dipsia, vomiting, haemorrhages, ophthalmopathy, strangury, splenomegali, cephalalgia, skin diseases, leprosy, fever, ulcer and general debility. The oil obtained from the seeds is useful in dyspepsia, skin diseases, leucoderma and greyness of hairs.
67	<i>Terminalia catappa</i> L.	Combretaceae	Indian almond	Badam	Tree	Fruit is useful in biliousness, bronchitis and bowels. Juice of the leaves is used in the preparation of the ointment for scabies, leprosy and other cutaneous diseases and also useful in headache and colic. The root bark is given in dysentery and diarrhoea. The bark cures bilious fevers.
68	<i>Terminalia chebula</i> Retz.	Combretaceae	Chebulic myrobalan	Harde	Tree	They are useful in vitiated conditions of tridoshas, wounds, ulcers, inflammations, hepatopathy, gastropathy, anorexia, helminthiasis, flatulence, haemorrhoids, jaundice, hepatopathy, splenopathy, pharyngodynia, hiccough, cough, uropathy and general debility.
69	<i>Thespesia populnea</i> (L.) Sol. ex Correa	Malvaceae	Indian tulip tree	Paras peeplo	Tree	It is useful in dermatopathy such as scabies, psoriasis, ringworm and guinea worm, leprosy, urethritis, gonorrhoea, haemorrhoids, haemorrhages, haemotysis, inflammations, wounds, ulcers, diarrhoea, dysentery, diabetes, cholera, ascites, dyspnea, cough, asthma, catarrh, and vitiated conditions of pitta. The bark and fruits possess more curative properties.
70	<i>Vitex negundo</i> L.	Verbinaceae	Chaste tree	Nagod	Tree	The roots are useful in vitiated conditions of vata, cephalalgia, otalgia, arthritis, inflammations, dyspepsia, colic, verminosis, flatulence, dysentery, uropathy, wounds, ulcers, bronchitis, cough, malarial fever, haemorrhoids, dysmannorrhoea, leprosy, dermatopathy, ophthalmopathy and general debility. The leaves are useful in vitiated conditions of vata, cephalalgia, sprains, orchitis, gout, splenohepatomegaly, Otorrhoea, inflammations and ulcers. The bark is useful in vitiated conditions of vata, odontalgia, verminosis and ophthalmopathy.
71	<i>Volkameria inermis</i> L.	Verbinaceae	Glory bowee	Vilayati mendi	Shrub	The juice of the leaves has much reputation to bring down the fever.

Table: 2 Distribution of plant species according to their family.

Family	No. of species
Caesalpiniaceae	7
Apocynaceae	6
Mimosaceae	5
Moraceae	5
Combretaceae	4
Rutaceae	4
Myrtaceae	3
Papilionaceae	3
Verbinaceae	3
Acanthaceae	2
Bignoniaceae	2
Boraginaceae	2
Euphorbiaceae	2
Lamiaceae	2
Malvaceae	2
Meliaceae	2
Sapotaceae	2
Amaranthaceae	1
Anacardiaceae	1
Annonaceae	1
Arecaceae	1
Bombacaceae	1
Capparaceae	1
Crassulaceae	1
Lythraceae	1
Moringaceae	1
Muntingiaceae	1
Oleaceae	1
Poaceae	1
Salvadoraceae	1
Simaroubaceae	1
Solanaceae	1

The Study also revealed that the presence of medicinally important trees and shrubs in the study area can be useful for the treatment of various ailments (Table 1). Mostly all the documented species have some therapeutic efficacies as shown in Table 1.<sup>9,10</sup> These important plant species found in the Miyawaki plantation is enrich the vegetation as well as making the healthy and pleasant environment, helps to

relieve stress and renew the spirits by providing calm and comfortable surroundings. These native forests have many functions and services such as disaster prevention and mitigation as well as air and water purification, and the blocking of sound, wind and dust.

## CONCLUSION

The present work is the output of continuous field study and 71 plant species belonging to 32 families were recorded. According to the analysis of the habit, trees are dominant as compared to herbs and shrubs. The most dominant families were Caesalpiniaceae and Apocynaceae while genera point of view *Ficus* and *Terminalia* were dominant. Most of the plants documented in the present study showed some ethnobotanical and/or pharmacological significance. The present study can serve basis for further work focusing on recorded plant species for phytochemical and pharmacological importance with active metabolite capable of broadening the sources of new herbal drugs.

## Conflict of interest statement

We declare that we have no conflict of interest.

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