

## Checklist of tree species from Girnar Eco-Sensitive Zone, Gujarat, India

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Received : 14<sup>th</sup> May, 2026 ; Accepted : 15<sup>th</sup> June, 2026

DOI:- <https://doi.org/10.5281/zenodo.21614782>

### ABSTRACT

Trees signify important positions in the terrestrial ecosystem. The understanding of the diversity and distribution of trees is of great importance as it provides habitat for animals, birds, insects, and mammals, etc. This study was conducted to give the first comprehensive checklist of tree species of the Girnar eco-sensitive zone located in the western part of Gujarat state in India. The eco-sensitive zone is set aside for the conservation of the endangered Asiatic lion *Panthera leo persica*. The checklist comprises a total of 74 tree species belonging to 57 Genera and 27 different families of Angiosperms. The study highlights their common name, local name, IUCN status, flowering and fruiting months, which will provide prolific insight for designing conservation strategies for the Girnar eco-sensitive zone.

**Key Words** - Girnar, eco-sensitive, checklist, trees

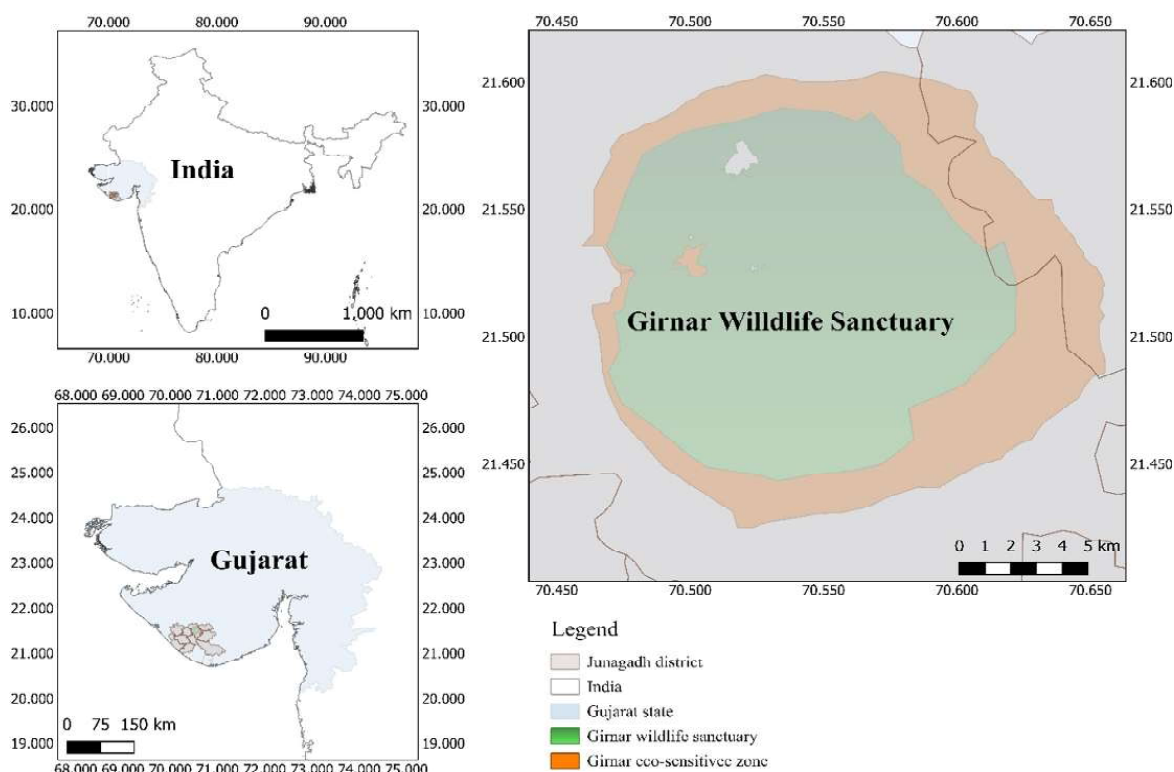
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### INTRODUCTION

Trees have diverse ecological and physiological roles, and hence are extremely important to the environment and human existence (Nowak & Dwyer, 2007; FAO, 2020). With their photosynthetic ability, they release oxygen and store carbon biomass, thereby limiting the number of greenhouse gases in the atmosphere, and carbon sequestration helps to alleviate the detrimental effects of climate change (Pan *et al.*, 2011; IPCC, 2022). Trees also offer vital habitats for a diverse range of animal and plant species, helping to conserve biodiversity (Lindenmayer & Laurance, 2017; FAO, 2020). They also serve as natural filters, absorbing and filtering sound and water, avoiding soil erosion, and mitigating the effects of natural calamities like floods (Nowak & Dwyer, 2007; Ellison *et al.*, 2017). Trees provide several tangible and intangible social, economic, and environmental benefits (Millennium Ecosystem Assessment, 2005;

FAO, 2020). Hence, it is very important to study the diversity of trees and thereby prepare the checklist for better management practices in the region (Kent, 2012; Das *et al.*, 2020; Carrero *et al.*, 2022; Gaikwad *et al.*, 2014; Bajpai *et al.*, 2015; Das *et al.*, 2022). Tree checklists serve as fundamental tools for documenting biodiversity, understanding species distribution patterns and supporting conservation planning (Carrero *et al.*, 2022; Meddour *et al.*, 2021).

There has been one more controversy regarding the definition of trees due to the lack of a clear description of trees (Lund, 2014; FAO, 2020). A tree can be defined as “a perennial plant with a single stem also known as a trunk at least 0.3 m (meters) (Lund, 2014) in diameter at breast height, more or less defined elevated crown and the height at maturity may reach beyond 3 m”. However, the definition of tree changes with country and



**Figure 1. Precise location of Girnar Eco-sensitive Zone with respect to India, Gujarat and Girnar wildlife sanctuary.**

different schools of thought prevail where some researchers count multi-stem, whereas some count the upper height limit of 2m, 3m, and 4-5m (FAO, 2020; Lund, 2014). Due to this, some plants are counted as shrub as well as tree in the same region by different researchers (Lund, 2014; Gschwantner *et al.*, 2009). Similar difficulties in standardising tree inventories and preparing regional checklists have also been reported in national and regional tree assessment studies (Carrero *et al.*, 2022; Meddour *et al.*, 2021). However, in the current study, the definition mentioned above was used for the study. Girnar eco-sensitive zone is located in Junagadh district, in the state of Gujarat, India (Government of India, 2011; Forest Department, Government of Gujarat, 2022). GESZ surrounds Girnar Hill, in which Guru Gorakhnath Shikhar is the highest peak (1110 MAMSL) of Gujarat (Shah, 1978; Forest Department, Government of Gujarat, 2022). Girnar forest is categorised as Southern Tropical Dry Deciduous and Dry Teak Forest (Champion & Seth, 1968; Forest Department, Government of Gujarat,

2022). 27 villages of Junagadh (16) and Bhesan (11) Taluka are part of GESZ and are included in the study site (Government of India, 2011). The geographical coordinates of the GESZ in the north are 21.60 latitude and 70.55 longitude, and in the south are 21.42 latitude and 70.51 longitude, which signifies the large area of the GESZ (forest department). The black and medium black soil, both rich in potassium but lacking in humus and nitrogen, make up the area's soil types (Central Ground Water Board [CGWB], 2013). The southwest monsoon season, which starts in the middle of June and ends in the middle of October, brings rain to the region. There are about 38 wet days per year and 916.9 mm of rainfall in the region (Junagadh Agricultural University, 2022). The Maximum temperature recorded in the year 2022 was 43.6°C, and the minimum temperature was 6.1 °C, with an average wind speed of 5.4 km/hour and an average evaporation rate of 5.5 mm/day, and a mean relative humidity is 60% (Junagadh Agricultural University, 2022).

## STUDY SITE

Eco-sensitive zones act as a shield around protected areas, wildlife sanctuaries, and national parks (MoEF, 2002; MoEFCC, 2011). Girnar Wildlife Sanctuary was established on 31<sup>st</sup> May 2008 to conserve some endemic taxa such as the Asiatic lion *Panthera leo persica* and Long-billed Vulture (Girnari Gidh) *Gyps indicus* (Government of Gujarat, 2008; Forest Department, Government of Gujarat, 2022). Soon after, on 31<sup>st</sup> May 2012, the Girnar Eco-sensitive Zone was declared, which aims to permanently safeguard and conserve the Asiatic Lion and the unique and endangered ecological diversity found in the wildlife sanctuary (Government of India, 2012). This eco-sensitive zone is located around Girnar wildlife sanctuary in 27 villages of Junagadh and Bhesan Talukas comprising a total of 9317 hectares of land and the radius of the zone wavering from 0-5 kilometres which are significantly less as decided in the policies of the Ministry of Environment and Forests (MoEF) in 2002 to designate a 10-kilometre buffer zone (MoEF, 2002; Government of India, 2012) (Fig. 1).

## OBJECTIVE

The principal objective behind the study is to prepare a checklist of the diversity of trees found in GESZ along with their local names, common names, flowering and fruiting months and status according to the IUCN red list, Botanical Survey of India and the forest department. Such checklist-based inventories are essential for biodiversity

assessment, conservation prioritisation, and ecosystem management (Carrero *et al.*, 2022; Das *et al.*, 2022; Bajpai *et al.*, 2015; Koti & Kotresha, 2021).

## METHODOLOGY

The study was carried out during January to March 2022 by performing field visits. Line intercept sampling method was used in which a total of 104 transect lines of 500 m each were selected systematically (Kent, 2012) and followed the forms of the topography in every village which covers the (I) Farm boundary, (II) Passing through the village, (III) The inner boundary of the ecosensitive zone (towards Girnar wildlife sanctuary) (IV) Roadside boundary (Outer boundary of GESZ) (Canfield, 1941; Mueller-Dombois & Ellenberg, 1974).

New plant species that were encountered were recorded and subjected to identification. Similar field-based inventory and checklist preparation approaches have been widely employed in floristic and tree diversity studies across India and elsewhere (Kumar *et al.*, 2020; Gaikwad *et al.*, 2014; Subramanian *et al.*, 2020; Koti & Kotresha, 2021). Identification of the species was carried out according to Shah (1978) and Bole & Pathak (1988). The names of the plants were identified and corrected according to the International Plant Name Index. Further, the flowering and fruiting seasons were observed or were found in relevant literature. (POWO, 2026; WFO, 2026). A list of tree species is listed in Table 1.

**Table 1. List of tree species found in Girnar ecosensitive zone, along with family, local name and flowering fruiting seasons**

| Sr. No. | Scientific name                                     | Family        | Local name            | Flowering Season | Fruiting Season   |
|---------|-----------------------------------------------------|---------------|-----------------------|------------------|-------------------|
| 1       | <i>Vachellia leucophloea</i>                        | Fabaceae      | Hermo Baval,          | June-November    | July-January      |
| 2       | <i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb. | Fabaceae      | Kalo Baval, Ram Baval | July-October     | August-December   |
| 3       | <i>Senegalia senegal</i> (L.) Britton               | Fabaceae      | Goradiyo Baval        | August-October   | October-April     |
| 4       | <i>Vachellia tortilis</i> (Forssk.) Galasso & Banfi | Fabaceae      | Israeli - Baval       | October-January  | November-February |
| 5       | <i>Adansonia digitata</i> L.                        | Malvaceae     | Rukhdo, Kalpavriksha  | April-May        | June-December     |
| 6       | <i>Aegle marmelos</i> (L.) Corrêa                   | Rutaceae      | Bili                  | January-May      | February-July     |
| 7       | <i>Ailanthus excelsa</i> Roxb.                      | Simaroubaceae | Arduso                | December-March   | February-May      |
| 8       | <i>Alangium salvifolium</i> (L.f.) Wangerin         | Cornaceae     | Ankol                 | February-April   | April-June        |
| 9       | <i>Albizia lebbbeck</i> (L.) Benth.                 | Fabaceae      | Kaliosaras, Shirish   | July-October     | October-March     |

|    |                                                |                |                                                       |                    |                     |
|----|------------------------------------------------|----------------|-------------------------------------------------------|--------------------|---------------------|
| 10 | <i>Alstonia scholaris</i> (L.) R.Br.           | Apocynaceae    | Saptaparni                                            | March-July         | April-August        |
| 11 | <i>Annona squamosa</i> L.                      | Annonaceae     | Sitaphal, Custard Apple, Sharifa                      | April-August       | June-August         |
| 12 | <i>Azadirachta indica</i> A.Juss.              | Meliaceae      | Limbo, Neem, Margosa                                  | December-March     | January-May         |
| 13 | <i>Balanites aegyptiaca</i> (L.) Delile        | Zygophyllaceae | Inguriyo, Desert Date                                 | November-December  | December-January    |
| 14 | <i>Bauhinia variegata</i> L.                   | Fabaceae       | Kachnar, Orchid Tree                                  | January-June       | January-December    |
| 15 | <i>Bauhinia racemosa</i> Lam.                  | Fabaceae       | Asundro, Bidi Leaf Tree                               | January-June       | January-December    |
| 16 | <i>Bauhinia tomentosa</i> L.                   | Fabaceae       | Pido Asundro                                          | January-June       | January-December    |
| 17 | <i>Bauhinia variegata</i> L.                   | Fabaceae       | kachnar                                               | January-June       | January-December    |
| 18 | <i>Salmalia rubra</i> (Buch.-Ham.)             | Bombacaceae    | Shimlo, Red-Silk Cotton                               | February-April     | March-July          |
| 19 | <i>Butea monosperma</i> (Lam.) Kuntze          | Fabaceae       | Khakhro, Palash, Flame of the Forest                  | December-January   | January-March       |
| 20 | <i>Cassia fistula</i> L.                       | Fabaceae       | Garmalo, Indian Laburnum, Golden Shower Tree, Amaltas | March-July         | January-December    |
| 21 | <i>Casuarina equisetifolia</i> L.              | Casuarinaceae  | Sharu, Beef-wood Tree, Sea-Oak, Whistling Pine        | April-June,        | September-February  |
| 22 | <i>Citrus × limon</i> (L.) Osbeck              | Rutaceae       | Lemon, Limbu                                          | January-December   | January-December    |
| 23 | <i>Cocos nucifera</i> L.                       | Arecaceae      | Nariyal, Coconut                                      | January-December   | January-December    |
| 24 | <i>Cordia dichotoma</i> G.Forst.               | Boraginaceae   | Mota Gunda, Indian Cherry, Vad Gundo                  | March-April.       | July-August.        |
| 25 | <i>Cordia sinensis</i> Lam.                    | Boraginaceae   | Nani Gundi                                            | December-February  | April-June          |
| 26 | <i>Dalbergia sissoo</i> Roxb. ex DC.           | Fabaceae       | Indian Rosewood, Sisum                                | March – April      | April-June          |
| 27 | <i>Delonix elata</i> (L.) Gamble               | Fabaceae       | White Gulmohar, Samrsro, Sanesro,                     | November-April     | December-June       |
| 28 | <i>Delonix regia</i> (Bojer ex Hook.) Raf.     | Fabaceae       | Gulmohar, Flame Tree, Royal Poinciana,                | March-July         | April-August        |
| 29 | <i>Dichrostachys cinerea</i> (L.) Wight & Arn. | Fabaceae       | Mordhundhyu, Sickie Bush                              | April - July       | July- September     |
| 30 | <i>Eucalyptus globulus</i> Labill.             | Myrtaceae      | Bluegum, Nilgiri                                      | December-May       | January-July        |
| 31 | <i>Ficus amplissima</i> Sm.                    | Moraceae       | Piper, Pipali                                         | November -January  | December-February   |
| 32 | <i>Ficus benghalensis</i> L.                   | Moraceae       | Vad, Banyan                                           | March - July       | April - August      |
| 33 | <i>Ficus microcarpa</i> L.f.                   | Moraceae       | Laurel Fig, Vad                                       | May - June         | June - August       |
| 34 | <i>Ficus racemosa</i> L.                       | Moraceae       | Cluster Fig, Goolar, Umardo                           | January - April    | March - July        |
| 35 | <i>Ficus religiosa</i> L.                      | Moraceae       | Pipado, Scared Fig                                    | February - March   | May - June          |
| 36 | <i>Gmelina arborea</i> Roxb. ex Sm.            | Lamiaceae      | Sevan, Shivan                                         | February - April   | May - July          |
| 37 | <i>Holarrhena pubescens</i> Wall. ex G.Don     | Apocynaceae    | Indrajav, The Easter Tree, Kuda, Pandhra Kuda, Kadvo  | January-June       | March-December      |
| 38 | <i>Holoptelea integrifolia</i> (Roxb.) Planch. | Ulmaceae       | Kanji, Charel, Palpaliya, Varli                       | April - July       | June - October      |
| 39 | <i>Leucaena leucocephala</i> (Lam.) de Wit     | Fabaceae       | Pardeshi Baval, Vilayati Baval                        | May-November       | May-February        |
| 40 | <i>Mangifera indica</i> L.                     | Anacardiaceae  | Mango, Aambo, Keri                                    | December-May       | February-July       |
| 41 | <i>Manilkara hexandra</i> (Roxb.) Dubard       | Sapotaceae     | Rayan, Wedge-Leaved Ape Flower                        | July –October      | January - March     |
| 42 | <i>Manilkara zapota</i> (L.) P.Royen           | Sapotaceae     | Chikoo, Sapodilla                                     | February - October | January - September |
| 43 | <i>Melia azedarach</i> L.                      | Meliaceae      | Limbo, Chinaberry Tree                                | January-December   | January-December    |
| 44 | <i>Pongamia pinnata</i> (L.) Pierre            | Fabaceae       | Karanj, Pongam Tree                                   | February-June      | April-September     |
| 45 | <i>Mimusops elengi</i> L.                      | Sapotaceae     | Borsalli, Bakul, Spanish Cherry                       | March - August     | June - October      |
| 46 | <i>Morinda pubescens</i> (Hook.f.) Kuntze      | Rubiaceae      | Indrajao, kadavo indrajav                             | May - February     | June - February     |

|    |                                                             |                |                                                            |                   |                     |
|----|-------------------------------------------------------------|----------------|------------------------------------------------------------|-------------------|---------------------|
| 47 | <i>Moringa concanensis</i><br>Nimmo ex Dalzell & A.Gibson   | Moringaceae    | Kadvo Saragvo, Konkan<br>Moringa                           | October-December  | November-February   |
| 48 | <i>Moringa oleifera</i> Lam.                                | Moringaceae    | Saragvo, Drumstick,<br>Horse Sadish Tree                   | January-December  | January-December    |
| 49 | <i>Morus alba</i> L.                                        | Moraceae       | Shetoor, White Mulberry                                    | February - April  | June - August.      |
| 50 | <i>Nyctanthes arbor-tristis</i> L.                          | Oleaceae       | Parijatak, Harshringar                                     | August - November | April - May         |
| 51 | <i>Peltophorum pterocarpum</i><br>(DC.) Backer ex K.Heyne   | Fabaceae       | Tamraparni, Copperpod                                      | January-December  | January-December    |
| 52 | <i>Psidium guajava</i> L.                                   | Myrtaceae      | Jamphal, Guava, Peru                                       | Whole Year        | Whole Year          |
| 53 | <i>Phoenix sylvestris</i> (L.) Roxb.                        | Arecaceae      | Wild Date Palm, Khajuri                                    | April-December    | May-January         |
| 54 | <i>Phyllanthus emblica</i> L.                               | Phyllanthaceae | Indian Goose Berry, Amla                                   | February - April  | May - October       |
| 55 | <i>Pithecellobium dulce</i> (Roxb.)<br>Benth.               | Fabaceae       | Manilla Tamarind,<br>Vilayati Ambli                        | November-April    | December-June       |
| 56 | <i>Monoon longifolium</i> (Sonn.)<br>B.Xue & R.M.K.Saunders | Annonaceae     | Asopalav, Mast-Tree,<br>False Ashok                        | December-May      | April-August        |
| 57 | <i>Prosopis cineraria</i> (L.) Druce                        | Fabaceae       | Khijado                                                    | October-June      | October-June        |
| 58 | <i>Neltuma juliflora</i> (Sw.) Raf.                         | Fabaceae       | Gando Baval                                                | February-March    | May- June           |
| 59 | <i>Samanea saman</i> (Jacq.) Merr.                          | Fabaceae       | Rato Shirish, Rato<br>Sarasdo, Rain Tree                   | March - July      | April - October     |
| 60 | <i>Sapindus emarginatus</i> Vahl                            | Sapindaceae    | Notched Leaf Soapnut,<br>Aritha                            | October - March   | November - April    |
| 61 | <i>Senna siamea</i> (Lam.) H.S.Irwin<br>& Barneby           | Fabaceae       | Kasheed, Kasood,<br>Siamese Senna,                         | August - February | October - May.      |
| 62 | <i>Santalum album</i> L.                                    | Santalaceae    | Chandan, Sukhad,<br>Shvet-Chandan                          | March-April       | April- May          |
| 63 | <i>Sterculia foetida</i> L.                                 | Malvaceae      | Jangly Badam, Bastard,<br>Poon Tree                        | February - April  | February - April    |
| 64 | <i>Syzygium cumini</i> (L.) Skeels                          | Myrtaceae      | <i>Syzygium cumini</i> (L.)<br>Skeels                      | February - April  | February - April    |
| 65 | <i>Syzygium malaccense</i> (L.)<br>Merr. & L.M.Perry        | Myrtaceae      | Safed Jambu, Malay<br>Apple, Mountain Apple,<br>Rose Apple | May to July       | June- August        |
| 66 | <i>Tamarindus indica</i> L.                                 | Fabaceae       | Tamarind Tree, Amla                                        | March-July        | April-November      |
| 67 | <i>Tectona grandis</i> L.f.                                 | Lamiaceae      | Teak, Saag                                                 | June - September  | September-December  |
| 68 | <i>Terminalia catappa</i> L.                                | Combretaceae   | Badam, Indian Almond                                       | February - May    | June to July        |
| 69 | <i>Terminalia elliptica</i> Willd.                          | Combretaceae   | Asan, Sadad                                                | July - September  | August - January    |
| 70 | <i>Terminalia bellirica</i><br>(Gaertn.) Roxb.              | Combretaceae   | Behda, Belleric<br>Myrobalan                               | February - May    | November - February |
| 71 | <i>Thespesia populnea</i> (L.) Sol. ex<br>Corrêa            | Malvaceae      | Paras Pipado, Indian<br>Tulip                              | Whole Year        | Whole Year          |
| 72 | <i>Wrightia tinctoria</i> (Roxb.)R.Br.                      | Apocynaceae    | Kado, Indrajav, Indrajao                                   | December-June     | January-July        |
| 73 | <i>Wrightia arborea</i> (Dennst.)<br>Mabb.                  | Apocynaceae    | Dudhlo, Woolly Dyeing<br>Rosebay                           | December-July     | January-Septemner   |
| 74 | <i>Ziziphus mauritiana</i> Lam.                             | Rhamnaceae     | Indian Plum, Mota Bor                                      | July - November   | October - March     |

\* *Santalum album* is a vulnerable species according to the Red List category, Redlist Criteria - A2de, Criteria Version -3.1, Region - India

**Table 2. Details of the number of families,  
genus, species and villages**

| Attribute              | Result |
|------------------------|--------|
| Vilages                | 27     |
| Total Quadrate Studied | 103    |
| Family                 | 27     |
| Genus                  | 57     |
| No of Species          | 74     |

## RESULTS

A total of 74 species belonging to 27 different families and 57 genera were found in a total of 27 villages, as mentioned in Table 2. Comparable checklist studies from protected areas and forest ecosystems have reported species richness ranging from 63 to over 500 tree species, depending upon habitat heterogeneity, geographical extent and



climatic conditions (Das *et al.*, 2020; Bajpai *et al.*, 2015; Das *et al.*, 2022; Meddour *et al.*, 2021). The Fabaceae family had 24 species from 18 different genera, followed by Moraceae with 6 species from 2 different genera, and Apocynaceae with 4 species from 3 different genera. Malvaceae registered 3 genus and 3 species, where as Sapotaceae had 2 genera and 3 species and Combretaceae having 1 genera and 3 species. Anacardiaceae, Boraginaceae, Casuarinaceae, Cornaceae, Oleaceae, Phyllanthaceae, Rhamnaceae, Rubiaceae, Santalaceae, Sapindaceae, Simaroubaceae, Ulmaceae, Zygophyllaceae registered 1 Species and 1 genera.

## DISCUSSION

In the present study, 74 tree species representing 57 genera and 27 families were recorded from 27 villages in Girnar Eco-Sensitive Zone. This indicates considerable floristic diversity in the rural landscape around the Girnar ecosystem and is consistent with observations from other checklist-based studies conducted in wildlife sanctuaries, forest landscapes and protected areas across India (Bole & Pathak, 1988; Mankad *et al.*, 2007; Kumar *et al.*, 2020; Bajpai *et al.*, 2015; Subramanian *et al.*, 2020; Koti & Kotresha, 2021). The observed tree diversity is a significant component of the total vegetation of the Girnar region, which is considered to be one of the floristically rich areas of Gujarat due to its varied terrain, climatic conditions and habitat heterogeneity (Mankad *et al.*, 2007).

Fabaceae was the most dominant family (Lewis *et al.*, 2005) with 24 species from 18 genera, i.e. about one third of all the species found in the study area. Similar dominance of Fabaceae has been reported from Odisha, Uttar Pradesh Terai, Point Calimere Wildlife Sanctuary, Yadahalli Chinkara Wildlife Sanctuary and several other regional checklist studies (Das *et al.*, 2022; Bajpai *et al.*, 2015; Subramanian *et al.*, 2020; Koti & Kotresha, 2021). In many floristic studies done in Gujarat and other tropical dry deciduous areas of India, Fabaceae has also shown similar dominance (Qureshimatva *et al.*, 2016). The dominance of Fabaceae could be related to their broad ecological adaptability, efficient nitrogen-fixing capacity, drought tolerance and

wide use as fuelwood, fodder, lumber and soil improver (Lewis *et al.*, 2005).

Families contributing significantly to ecosystem functioning and availability of resources, such as Anacardiaceae, Boraginaceae, Casuarinaceae, Cornaceae, Oleaceae, Phyllanthaceae, Rhamnaceae, Rubiaceae, Santalaceae, Sapindaceae, Simaroubaceae, Ulmaceae, and Zygophyllaceae showed modest representation in the study region which also matches with Bole & Pathak, (1988).

The family composition in the present study is very much similar to the floristic pattern in Girnar Hills and other regions of Saurashtra, where the major constituents of woody vegetation are Fabaceae, Moraceae, Malvaceae, Combretaceae and Rutaceae (Bole & Pathak, 1988; Mankad *et al.*, 2007). The communities of Girnar Eco-Sensitive Zone are vital for the conservation of the biodiversity and ecological stability of the region, as per the predominance of economically and ecologically important tree families (Mankad *et al.*, 2007). Regional and national checklist studies have emphasised that systematic documentation of tree diversity provides baseline information for conservation planning, monitoring of threatened taxa and sustainable ecosystem management (Carrero *et al.*, 2022; Meddour *et al.*, 2021; Das *et al.*, 2022; Koti & Kotresha, 2021). The tree diversity reported indicates the conservation value of the village ecosystems and their contribution to the overall biodiversity conservation of the Girnar landscape (Bole & Pathak, 1988; Mankad *et al.*, 2007).

## REFERENCES

- Bajpai, O., Kumar, A., Srivastava, A. K., Kushwaha, A. K., Pandey, J., & Chaudhary, L. B. 2015. Tree species of the Himalayan Terai region of Uttar Pradesh, India: A checklist. *Check List*, 11(4), 1718. <https://doi.org/10.15560/11.4.1718>
- Bole, P. V., & Pathak, J. M. 1988. *Flora of Saurashtra* (Vols. 1–3). Botanical Survey of India, Kolkata.
- Canfield, R. H. 1941. Application of the line interception method in sampling range

- vegetation. *Journal of Forestry*, 39(4), 388–394. <https://doi.org/10.1093/jof/39.4.388>
- Carrero, C., Bruns, E. B., Frances, A., Jerome, D., Knapp, W., Meyer, A., Mims, R., Pivorunas, D., Speed, D., Eberly, A. T., & Westwood, M. 2022. Data sharing for conservation: A standardized checklist of US native tree species and threat assessments to prioritize and coordinate action. *Plants, People, Planet*, 4(5), 522–538. <https://doi.org/10.1002/ppp3.10305>
- Central Ground Water Board. 2013. *Ground water information booklet: Junagadh District, Gujarat*. Ministry of Water Resources, Government of India.
- Champion, H. G., & Seth, S. K. 1968. *A revised survey of the forest types of India*. Government of India Press.
- Das, P. K., Sahoo, T., & Panda, P. C. 2022. Forest trees of Odisha, India: An updated checklist. *Plant Science Today*, 9(4), 1021–1031. <https://doi.org/10.14719/pst.1972>
- Das, R. C., Pahari, G. K., & De, M. 2020. A checklist of trees and shrubs in the campus of Gurudas College, Kolkata, West Bengal, India. *International Journal of Advancement in Life Sciences Research*, 3(2), 50–55. <https://doi.org/10.31632/ijalsr.2020.v03i02.006>
- Ellison, D., Morris, C. E., Locatelli, B., Sheil, D., Cohen, J., Murdiyarso, D., Gutierrez, V., van Noordwijk, M., Creed, I. F., Pokorny, J., Gaveau, D., Spracklen, D. V., Tobella, A. B., Ilstedt, U., Teuling, A. J., Gebrehiwot, S. G., Sands, D. C., Muys, B., Verbist, B., ... Sullivan, C. A. 2017. Trees, forests and water: Cool insights for a hot world. *Global Environmental Change*, 43, 51–61. <https://doi.org/10.1016/j.gloenvcha.2017.01.002>
- Endress, M. E., Liede-Schumann, S., & Meve, U. 2014. An updated classification for Apocynaceae. *Phytotaxa*, 159(3), 175–194. <https://doi.org/10.11646/phytotaxa.159.3.2>
- Food and Agriculture Organization (FAO). 2020. *Global Forest Resources Assessment 2020: Terms and definitions*. Food and Agriculture Organization of the United Nations. <https://doi.org/10.4060/ca9825en>
- Forest Department, Government of Gujarat. 2022. *Girnar Wildlife Sanctuary and Girnar Eco-Sensitive Zone records*. Gujarat Forest Department, Gandhinagar.
- Gaikwad, S., Gore, R., & Garad, K. 2014. Checklist of the tree flora of the Balaghat Ranges, Maharashtra, India. *Check List*, 10(5), 1071–1082. <https://doi.org/10.15560/10.5.1071>
- Government of Gujarat. 2008. *Notification declaring Girnar Wildlife Sanctuary, Junagadh District, Gujarat*. Forest and Environment Department, Government of Gujarat.
- Government of India. 2011. *Final notification of Girnar Eco-Sensitive Zone, Junagadh District, Gujarat*. Ministry of Environment, Forest and Climate Change, New Delhi.
- Government of India. 2012. *Final notification of Girnar Eco-Sensitive Zone, Junagadh District, Gujarat (S.O. 1189(E), dated 31 May 2012)*. Ministry of Environment and Forests, New Delhi.
- Gschwantner, T., Lanz, A., & Vidal, C. 2009. Common tree definitions for national forest inventories in Europe. *Silva Fennica*, 43(2), 303–321. <https://doi.org/10.14214/sf.463>
- Intergovernmental Panel on Climate Change (IPCC). 2022. *Climate change 2022: Mitigation of climate change*. Cambridge University Press. <https://doi.org/10.1017/9781009157926>
- Junagadh Agricultural University. 2022. *Meteorological observatory annual weather data, Junagadh*. Department of Agricultural Meteorology, Junagadh Agricultural University, Junagadh.
- Kent, M. 2012. *Vegetation description and data analysis: A practical approach* (2nd ed.). Wiley-Blackwell.
- Koti, M., & Kotresha, K. 2021. Trees of Yadahalli Chinkara Wildlife Sanctuary, Bagalkot, Karnataka, India: A checklist. *Plant Science Today*, 8(4), 871–877. <https://doi.org/10.14719/pst.1277>

- Kumar, A., Sachan, S., Shil, T., & Maurya, O. N. 2020. An annotated checklist of the vascular plants of the Udaipur Wildlife Sanctuary, West Champaran, Bihar, India. *Tropical Plant Research*, 7(1), 209–228. <https://doi.org/10.22271/tpr.2020.v7.i1.027>
- Lewis, G., Schrire, B., Mackinder, B., & Lock, M. 2005. *Legumes of the World*. Royal Botanic Gardens, Kew.
- Lindenmayer, D. B., & Laurance, W. F. 2017. The ecology, distribution, conservation and management of large old trees. *Biological Reviews*, 92(3), 1434–1458. <https://doi.org/10.1111/brv.12290>
- Lund, H. G. 2014. What is a tree? Definitions do make a difference. *International Forestry Review*, 16(2), 139–150. <https://doi.org/10.1505/146554814811724801>
- Mankad, A. U., Jadeja, B. A., & Odedra, N. K. 2007. *Floristic diversity of Girnar Hills, Gujarat, India*. Department of Biosciences, Saurashtra University, Rajkot.
- Meddour, R., Sahar, O., & Médail, F. 2021. Checklist of the native tree flora of Algeria: Diversity, distribution, and conservation. *Plant Ecology and Evolution*, 154(3), 405–418. <https://doi.org/10.5091/plecevo.2021.1868>
- Millennium Ecosystem Assessment. 2005. *Ecosystems and human well-being: Biodiversity synthesis*. World Resources Institute.
- Ministry of Environment and Forests (MoEF). 2002. *Guidelines for declaration of Eco-sensitive Zones around National Parks and Wildlife Sanctuaries*. Government of India, New Delhi.
- Ministry of Environment, Forest and Climate Change (MoEFCC). 2011. *Guidelines for Eco-Sensitive Zones around protected areas*. Government of India, New Delhi.
- Mueller-Dombois, D., & Ellenberg, H. 1974. *Aims and methods of vegetation ecology*. John Wiley & Sons.
- Nowak, D. J., & Dwyer, J. F. 2007. Understanding the benefits and costs of urban forest ecosystems. In J. E. Kuser (Ed.), *Urban and community forestry in the Northeast* (2nd ed., pp. 25–46). Springer. [https://doi.org/10.1007/978-1-4020-4289-8\\_2](https://doi.org/10.1007/978-1-4020-4289-8_2)
- Pan, Y., Birdsey, R. A., Fang, J., Houghton, R., Kauppi, P. E., Kurz, W. A., Phillips, O. L., Shvidenko, A., Lewis, S. L., Canadell, J. G., Ciais, P., Jackson, R. B., Pacala, S. W., McGuire, A. D., Piao, S., Rautiainen, A., Sitch, S., & Hayes, D. 2011. A large and persistent carbon sink in the world's forests. *Science*, 333(6045), 988–993. <https://doi.org/10.1126/science.1201609>
- POWO. 2026. *Plants of the World Online*. Royal Botanic Gardens, Kew.
- Qureshimatva, U. M., Maurya, R. R., Gamit, S. B., & Solanki, H. A. 2016. Check list of flowering plants in Panchmahal District, Gujarat, India. *Forest Research*, 5(3), 176. <https://doi.org/10.4172/2168-9776.1000176>
- Shah, G. L. 1978. *Flora of Gujarat State* (Vols. 1–2). Sardar Patel University, Vallabh Vidyanagar, India.
- Shanahan, M., So, S., Compton, S. G., & Corlett, R. T. 2001. Fig-eating by vertebrate frugivores: A global review. *Biological Reviews*, 76(4), 529–572. <https://doi.org/10.1017/S1464793101005760>
- Subramanian, M. P. S., Ganthi, A. S., & Subramonian, K. 2020. Tree species of the Point Calimere Wildlife and Bird Sanctuary in Tamil Nadu, India: A checklist. *International Journal of Botany Studies*, 5(4), 102–107.
- World Flora Online (WFO). 2026. *World Flora Online*. <http://www.worldfloraonline.org>