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An Inventory of Dye-Yielding Plants Indigenous to Gujarat.

Un inventario de plantas productoras de tinte autóctonas de Gujarat.

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ABSTRACT

Gujarat harbors a remarkably rich biodiversity of angiosperms. Some of them produce colors, commonly known as dye-yielding plants. However, many plants remain unexplored for their dye-yielding capacity. The report is the first compilation using the state, and regional flora and published literature on the natural dye-yielding plant in Gujarat into a catalogue that reveal various information regarding the plants and the dyes. This archive records 210 dye-yielding plants belonging to 204 genera and 74 families, along with their vernacular name, plant parts, dye color, dye classification, and dye use. The Caesalpiniaceae, Euphorbiaceae, Mimosaceae, and Asteraceae families constitute the highest species. The genera representing the highest number of species included *Acacia, Bauhinia, Senna-Cassia, Terminalia, Ficus*, and *Indigofera*. The plant parts- bark, flower, leaf, and fruit yielded most of the dyes. The majority of the dyes belong to Flavone, Tannin, Anthocyanin, and Anthraquinone classes. The dyes from plant resources are mainly explored as textile dyes, food colorants, cosmetic dyes, and mordants. The documented indigenous catalogue is an addition to the knowledge of the dye-yielding plants and provides an opportunity for their sustainable usage.

Keywords: Dye yielding plants, Gujarat, natural dyes, sustainable, checklist, catalogue.

RESUMEN

Gujarat alberga una biodiversidad de angiospermas notablemente rica. Algunas de ellas producen colores, comúnmente conocidas como plantas productoras de colorantes. Sin embargo, muchas plantas permanecen sin explorar por su capacidad de producir colorantes. El informe es la primera compilación que utiliza la flora estatal y regional y la literatura publicada sobre la planta productora de tinte natural en Gujarat en un catálogo que revela información diversa sobre las plantas y los tintes. Este archivo registra 210 plantas productoras de tinte pertenecientes a 204 géneros y 74 familias, junto con su nombre vernáculo, partes de la planta, color del tinte, clasificación del tinte y uso del tinte. Las familias Caesalpiniaceae, Euphorbiaceae, Mimosaceae y Asteraceae constituyen las especies más altas. Los géneros que representaron el mayor número de especies incluyeron *Acacia, Bauhinia, Senna-Cassia, Terminalia, Ficus* e *Indigofera*. Las partes de la planta (corteza, flor, hoja y fruto) produjeron la mayoría de los tintes. La mayoría de los colorantes pertenecen a las clases Flavone, Tannin, Anthocyanin y Anthraquinone. Los tintes de los recursos vegetales se exploran principalmente como tintes textiles, colorantes alimentarios, tintes cosméticos y mordientes. El catálogo

indígena documentado es una adición al conocimiento de las plantas productoras de colorantes y brinda una oportunidad para su uso sostenible.
Palabras clave: plantas productoras de colorantes, Gujarat, colorantes naturales, sostenible, lista de verificación, catálogo.

INTRODUCTION

Colors are imperative to humankind. The art of dyeing and painting have accompanied the creation of human civilization since prehistoric times. The art of dyeing and painting has prevailed since prehistoric times, and it must have been born to fulfill the necessity of adorning and beautifying objects used in daily life (Cassibry 2017). The colors used in the paintings and artifacts, their social significance, and the extent of their trade are the primary elements of people's overall history (Stamkou et al. 2017. Archaeological evidence suggests that ancient Phoenicians were the first to discover and use dyes. A famous shellfish dye known as Tyrian Purple, extracted from the snails of Tyre city, was adapted for all civilizations around the Mediterranean (Karapanagiotis 2019). The dye was restricted to only royals, priests, and senior security officers due to its high price, brightness, and colorfastness. Thereon, the use of Tyrian purple was known to ancient Greeks then Romans and through them to Byzantium and Medieval Europe (Coccato et al. 2021). In Europe, the use of another way more beautiful dye named cochineal from lice that infect certain types of cactus, initiated in 1958 from Mexico. Around the same time, Qing and Ming dynasties in China also adopted the use of natural dyes evident in the Chinese literature that archives various dye recipes (Bellemare 2021). According to Field 2019, Phonecians, Indians, and Vetecians instilled the tradition of natural dyes after the Chinese. The advent of natural dyes in Indian history dates back to the Vedic period, referring to their characteristics and properties (Decelles 1949). The paintings recovered from the demolished sites from the Ajanta caves displayed the use of natural dyes (Borgohain et al. 2018). Furthermore, the madder dyed cloth retrieved from the Mohenjo Daro and Harappa civilizations is a testimony of the prevalence of natural dyes from the past. Epics like the Code of Manu and Mahabharata that Sita received various dyed garments during her wedding. Kusumba was the most prominent dye used in ancient India, and the dye manufacturer "Rangakara" is also cited in Mahabharat and Ramayana (Nandy 2021). The Greek scholar Arrian also documented that block printing was an ancient folk tradition in India.

India was a pioneer of the textile industry for the entire world and has applied many natural dyes since the late Bronze Age and Iron age. Yellow dyes were from quercitron (*Quercus tinctoria*), saffron (*Crocus sativus*), and safflower (*Carthamus tinctorius*). Purple dyes incorporated Tyrian from the shellfish species Murex and Purpura and Orchil dye from lichens; black, blue, and purple shades from Logwood (*Haematoxylon campechiancum L.).* Red dyes included madder, cochineal, kermes, and brazilwood, and the primary source of blue dye, Indigo, was *Indigofera tinctoria* and woad (*Isatis tinctoria*).

Indigo from *Indigofera tinctoria* upholds an important history out of all the dyes. Since ancient times, India was the only home to *Indigofera* species, and the devised process and practice of dyeing was ongoing. However, when the Britishers encountered the brilliant blue in 1782, a small fraction of indigo was supplied to England. Thereon, the United Kingdom, China, United States of America, Russia, Greece, Italy, Germany, Egypt,

France, Belgium, Turkey, Austria, Arabia, Malta, and Persia evolved as the exporters of Indigo from India Records show that in 1895, India imported 40,000 tonnes of Indigo to England alone. However, after 1887 the Indigo trade experienced the most substantial setback. This reversal resulted from an accidental discovery of a synthetic pigment known as mauveine by an English chemist William Henry Perkin. Soon Perkin developed a range of synthetic colors such as Perkin's Green, Britannia Violet, and Alizarin. Many German chemists tried to introduce the crimson red dye, Alizarin in the Indian market; that did not succeed initially. However, the Indian market introduced its dyestuff with time due to its intense promotional activities. Momentum in the use of synthetic dyes amongst the native dyers is due to their superiority over the indigenous dyes (Hamdy & Hassabo 2021).

Since the 1900s, synthetic dyes have been in great demand owing to their excellent reproducibility, wide range of colors, fastness properties, and cheaper cost. However, synthetic dyes are not environmentally friendly since the production involves extreme temperature, pH, metal catalysts, and strong acids. Petroleum, a non-renewable source of energy, is a standard substrate for dye production. In addition, synthetic dye production yields many effluents that comprise toxic chemicals as side products. The dependency of synthetic dyes on their solubility in water is of great concern since the toxic effluents discharged into the water bodies are untreated due to insufficient environmental legislation. Synthetic dyes constitute a tiny portion of the industrial effluents; however, they impose a threat since they are very stable and resistant to various chemicals, light, and certain biological activities for a long duration due to their complex structure. Accordingly, synthetic dye accumulation increases biochemical oxygen demand (BOD) and chemical oxygen demand (COD) (Sanda & Liliana 2021). Moreover, the increased use of synthetic dyes affects the color of water resources and modifies the absorption properties of planktons, decreasing their photosynthetic capacity. Metal ions sequestered by the dyes provoke toxicity for the marine animals in the water bodies. The disposition of dyes also reacts with some byproducts of effluents to form aromatic complexes that cause mutations and cancer in aquatic animals. When exposed to higher concentrations, most of the dyes and their intermediates are cytotoxic, mutagenic, and genotoxic to living organisms. The toxic breakdown products of the dyes result in many health problems ranging from skin irritations, allergies, decrease in growth, fertility rate, and food intake capacity and cause malfunctioning of organs such as heart, kidney, liver, and spleen. Nevertheless, with the increasing awareness of eco-friendly and sustainable products, natural dyes are gaining demand (Sanda & Liliana 2021). Natural dyes can be acquired directly from plants, microorganisms, agricultural waste, and by-products. Natural dyes can be extracted from plant parts, seeds, seed coats, flowers, fruits, leaves, stems, roots, and bark. Natural dyes derived from plants are biodegradable, eco-friendly, renewable, sustainable, non-allergic, and non-toxic. Nevertheless, their availability, percent dye yield, and reproducibility are significant issues with using natural dyes (Hamdy & Hassabo 2021). Regardless of the concerns of natural dyes, they confer a sustainable option to revert and prevent the detrimental effects on health and the environment. Researchers have annotated natural dyes with medicinal, anti-allergic, anti-inflammatory, anti-microbial, and anti-cancerous properties. In India, besides the health benefits, dyes are in demand in the textile, cosmetics, and food industries (Baliarsingh 2012).

Each state of India harbors a unique tradition for using natural dyes. The contribution of Gujarat, known as the state of colors, to the Great Indian textile trail, dates back to 3000 BC. Historians view Gujarat as the original home to textile dyeing and printing (Chen 2022). It has dominated the cotton trade and the prod other

traditional textile prepared in Kutch and Saurashtra region adapted by the Rabari community is the Bandhani (Kumari 2021). In this resist-dyeing technique, the cloth is tied into tiny knots to form a design, dyed, and then untied. Initially, natural plants dyes- Scrap metal (black), onion skins (orange), indigo leaves (blue), Magista wood (red), Sapan wood (pink), pomegranate peel (dark yellow), and Turmeric roots (yellow)- imparted color to the fabric for the bandhani designs, however, nowadays synthetic dyes are utilized. Another well-known textile crafted in Rajasthan, Leheriya, is also a tie and dye art that usually adopts two color patterns alternatively in diagonal waves. Leheriya prefers synthetic hues over the traditional plant dyes alizarin for red and indigo for blue shades in the present times. Many such textiles, revenue generators for the region, are crafted with synthetic dyes owing to their colorfastness and availability. Nevertheless, the textile industry contributes 80 % of the pollution generated by synthetic dyes. Hence, it entails searching for natural colorant resources. Besides, textiles are extensively used in the Navratri dance festival held over nine nights, and colors are crucial for the Holi festival celebrated by spreading vibrant-colored water and powder among friends and family. Even today, flower colors- saffron from Palash, yellow from marigold, pinkish-red powder from hibiscus, and rose- suction of block-printed textiles since ancient India (Edwards 2007). Every tribe, region, festival, and individual reflects their tradition through their fabrics and costumes. Gujarat embraces a legacy of textiles affiliated to its past, which is ancestral and acculturated. The dyes invariably impart the allure to these textiles. The first and foremost application of natural dyes was her textile coloration. Gujarat is renowned for its peculiar textiles. Ajrakh of the Kutch region is an art of printing textiles with wooden blocks crafted by the Khatri community and the Dalit artisans (Kumari 2021). They utilize indigo for blues, madder roots for reds and maroons, and rusty iron solutions for black printing to generate patterns through tiny dots. Patola is a legendary heritage of Indian textiles from Patan in northern Gujarat. It is a double ikat (bind) fabric where the dyed warp and weft threads with bright red, reddish-brown, dark blue, green, yellow, and golden colors were first processed from minerals to plant dyes, and nowadays, synthetic dyes are intertwined (Kumari 2021). These are sources of Holi colors. Moreover, sindhur applied on the foreheads by married ladies prepared from annatto dye from Bixa orellana, and henna dye from Lawsonia inermis is regularly used as a hair dye. Curcumin from Curcuma longa, an active ingredient of the Gujarati staple food, is known to impart anti-microbial activity. FSSAI has approved many plant pigments as food colorants.

The lagging commercialization and usage of natural dyes owe to the in-depth knowledge gap. Few attempts to document and collect information regarding the dye-yielding plants and the techniques to extract these dyes are insufficient to fill the knowledge gap (Morales-Oyervides 2020). Another essential aspect that contributes to the void is the expertise in implementing varied types of procedures for pigment extraction and the continuous unfavorable publicity by the synthetic dye manufacturing companies. These companies advertise otherwise since they disagree with sharing the market with natural dye producers (Benucci 2022).

Natural dyes consist of chemical constituents of different properties producing various shades from plant parts, unlike synthetic dyes; this asset is yet to be studied (Samanta 2018). The only shortcomings of processing natural dyes are that they are time-consuming and require more labor. However, the already saturated environment cannot tolerate more synthetic dye production and use hazards. Therefore, there is an urgent necessity to identify the natural plant resources and bring the traditionally used plants indigenous to India into the main streamline will increase the commercialization (Senthilkumar & Murugesan 2022). With the increment in public

awareness on health concerns, eco-safety, and non-toxic, sustainable products, new plant resource bioprospecting for plant colorants is in demand ShetVerenkar 2021).

Gujarat harbors rich biodiversity; nonetheless, literature documents only a few reports of dye-yielding plants from some districts and regions. In addition, only 1 % of the total natural coloring agents are exploited for dyeing purposes (Mansour 2018). With this perspective, the present study catalogues a collective baseline record of Gujarat for dye-yielding plants.

MATERIALS AND METHODS

Field Assessment: The present checklist includes plants in Gujarat used as a dye source, and it consists of plant resources native to the region and cultivated and introduced species. Gujarat is situated in the 21°00' to 24°14' N latitude and 68°48' to 76°70' E longitude and comprises an area of 75,686 sq mi (196,030 km2) with the longest coastline in the country-992 miles (1,596 km) long (24% of Indian sea coast). Gujarat state is on the western coast of India with a coastline dotted with 41 ports: 1 major, 11 intermediate, and 29 minor. All parts of the state are not more than 160 km from the sea. It is the fifth-largest state by area and the ninth-largest state by population. Rajasthan borders Gujarat towards the northeast, Madhya Pradesh to the east, Maharashtra to the southeast, Dadra and Nagar Haveli and Diu and Daman to the south, and Pakistani province Sindh and the Arabian Sea to the west. Gandhinagar is its capital city, while Ahmedabad is its largest city. Gujarat consists of 33 districts, Kutch being the largest, and Dang being the smallest district of Gujarat. The 33 districts are dispersed into five regions accordingly: North Gujarat consists of six districts, Aravalli, Banaskatha, Gandhinagar, Mehsana, Patan, and Sabarkantha. At the heart of the state, Central Gujarat comprises ten districts, Ahemdabad, Anand, Bharuch, Chhota Udaipur, Dahod, Kheda, Mahisagar Narmada, Panchmahal, and Vadodara. The largest region, Saurashtra, encompasses eleven districts, Amreli, Bhavnagar, Botad, Dwarka, Gir Somnath, Jamnagar, Junagadh, Morbi, Porbandar, Rajkot, and Surendranagar. The fifth and largest region, Kutch, bears no districts. Ahmedabad is the highest populated, while Dang is the lowest populated district. Surat is the most densely populated, while Kutch is the least populated district (Figure 1- Recreated & retrieved from *https://paintmaps.com/map-charts/245c/Gujarat-map-chart)*

The districts are subdivided into 253 Talukas (subdivisions of districts) in Gujarat. Narmada is the largest river, followed by Tapi and then Sabarmati, which has the longest trail throughout Gujarat. The low mountains of India- Sahyadri, Aravalli, Saputara, and Vindhya- edge the state's eastern borders.

Besides these, Jessore, Barda, Chotila, and the Gir hills make up a minority of the mountains in Gujarat. The tallest peak in the state is Girnar, and Saputara is the only hill station. Gujarat experiences four significant seasons: Winters (November through February) is mild, pleasant, and dry. In winter, the day temperature is around 80° F, while it drops into the mid-50s ° F at night. Summer (March through May) is scorching, with the daytime temperature being 115° F and the night temperature being 90° F. The monsoon season (June through September) is usually hot and humid, and the daytime temperature is 100 °F but falls to 80° F by night. The monsoon season is a characteristic of Gujarat weather since there are intense floods in some areas of the state

while others are devoid of rainfall. The last and shortest is the autumn season (October). North Gujarat is drier than South Gujarat. Average rainfall in Gujarat ranges from 35 to 152 centimeters, with North Gujarat receiving from 51 to 102 centimeters, and South Gujarat receiving the highest rainfall, from 76 to 152 centimeters. Saurashtra region bares low rainfall compared to other regions, and Kutch, the desert region, faces water scarcity due to lack of rainfall, less than 380 millimeters annually. Therefore, it is evident that Gujarat weather has its distinct characteristics. The state regions endow broad classes of soils. In Central Gujarat, it is clay loam to clay or sandy loam to loam and medium black soil in floodplains, midland, and coastal area. The most prevalent soil texture in North Gujarat is sandy loam to loam and alluvial, and South Gujarat is deep black and alluvial soil. Shallow and medium black is the predominant soil in the Saurashtra region. In contrast, sandy and saline soil prevails in the Kutch region.

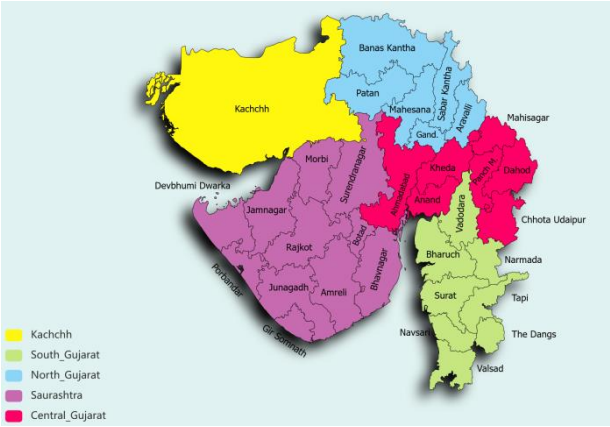

Figure 1: Gujarat Map with five major regions.

Gujarat is home to various forest types:

- Dry deciduous, tropical, scrub, savannah, and mangrove forests in Central and North Gujarat.
- The moist deciduous forests in South Gujarat.
- Thorny forests in Saurashtra and Kutch region.

Data Retrieval: The current inventory is a product of relentless literature consultation about natural dye resources of India (Siva 2007; Gokhale 2004; Das & Kalita 2016; Aggarwal & Shukla 2020; Aggarwal 2021; Wani et al. 2021). Appraisal on the natural dye-yielding plants' reports of certain Indian states assisted in substantiating the dye-yielding properties of plants (Krishnamurthy et al. 2002; Akimpou et al. 2005; Mahanta & Tiwari 2005; Ghosh & Das 2007; Kar & Borthakur 2008; Potsangbam et al. 2008; Choudhary & Upadhyay 2011; Alawa et al. 2013; Rashid 2013; Sharda & Rastogi 2013; Srivastava & Gautam 2014; Sutradhar et al. 2015; Das & Kalita 2016; Verenkar & Sellappan 2018; Samant et al. 2019; Patil et al. 2019). The online databases confirmed the taxonomy for selected plants: The Plant List - http://www.theplantlist.org/; Integrated Taxonomic Information System - https://www.itis.gov/; Tree of Life web project - http://tolweb.org/tree/.

The Flora of a few reported Gujarat districts and India affirmed the occurrence and distribution of the plants within Gujarat. Digital Flora of Gujarat (http://gujaratflora.com/); E-Flora of Gandhinagar(https://www.efloraofgandhinagar.in/); Flora of Aravalli District (Bhagat, Patel, & Jangid 2021);

Flora of Dang (Tadvi 2014); Flora of Panchmahal (Patel et al. 2014). Flora of South Gujarat (Bhatt et al. 2014); Flora of Sabarkantha district (Vediya & Kharadi 2011); Flora of Barda Hills (Nagar 2005); Flora of Valsad District (Rao 2015); Flora of little rann of Kutch (Ishnava et al. 2021).

RESULTS AND DISCUSSION

The current report is a first attempt to compile the dye-yielding plants of Gujarat into an inventory catalogue. Table 1 archives the data of the family name, botanical name, part of the plant used for dye extraction, dye colour, dyeing application, distribution of the plant within Gujarat, and the references for dyeing application. The data retrieved from various resources are compiled into a catalogue to inculcate the awareness of sustainable rewards. When considering the pollution generated, the industrial sustainability indicator involves biodiversity at the core supporting SDG 15 'Life on Land'; planting and conserving the biodiverse dye-yielding plants, which are biodegradable, mitigates the environmental issues (Elsahida et al. 2019). Extracting natural dyes from various plant parts generates a lot of biomass waste that can be reduced by bio compost production, reused as animal feed, and recycled for biogas production (Saha & Basak 2020). The majority of the synthetic dye pollution owes to the textile and finishing industry, which discharges synthetic dyes and untreated effluents into the water resources (Uddin 2021). To claim the eco-friendliness of natural dyes, mordant producing plant species applied in the dyeing process will make the entire cycle of production sustainable (Baseri 2022). Augmenting the requirement for natural dyes will develop new horizons for entrepreneurship, increase employment, and reduce poverty (Correa 2021).

We found, in total, 210 dye-yielding plants that belong to 204 genera and 74 families. The recorded plant species belong to 70 Dicotyledon families and 4 Monocotyledon families. The Caesalpiniaceae family constitute the highest, with 16 species; followed by Euphorbiaceae, Mimosaceae, and Asteraceae with 12 species; Rubiaceae, Moraceae, Malvaceae, Combretaceae, Apocynaceae with 6 species; Solanaceae, Meliaceae, Amaranthaceae, and Anacardiaceae with 5 species; Rhizophoraceae, Rhamnaceae, Fabaceae, and Bignoniaceae with 4 species; Zingiberaceae, Sapotaceae, Lythraceae, Nyctaginaceae, and Myrtaceae with 3 species and the rest of families encompass minimum species (Figure 2). The higher number of species constituted the following genera: Acacia (9 species); Bauhinia, Senna-Cassia, and Terminalia (5 species); Ficus and Indigofera (4 species); Caesalpinia and Garcinia (3 species), and the remaining genera with minimum species.

Many parts of the plant produced the dyes. The percent of plant parts reported are as follows: bark (25%), flower 20%), leaves (16%),) fruit (13%), seed(6%), whole plant (3%), rhizome, pod, stem, and wood (2%), peels, flower bracts, cladode, coir, seed coat, pericarp, shoot, scales, sap and stem (1%) (Figure 3). Approximately 29 plant species produce dyes from more than one part of the plant. In nature, the colours of the dye vary from species to species and their parts. The colours of the dyes from the plants situated in Gujarat comprise black, brown, yellow, orange, red, green, blue, purple, violet, pink, golden, maroon, and auxillary. Many dyes possessed mixed shades of blue-grey, black-brown, pink-purple, light red, pale brown, greenish-brown, bluish-black,

yellowish-orange, grayish-brown, brownish-yellow, reddish-Khaki, yellowish-green, reddish-brown, reddish-purple, dark pink, and dark brown.

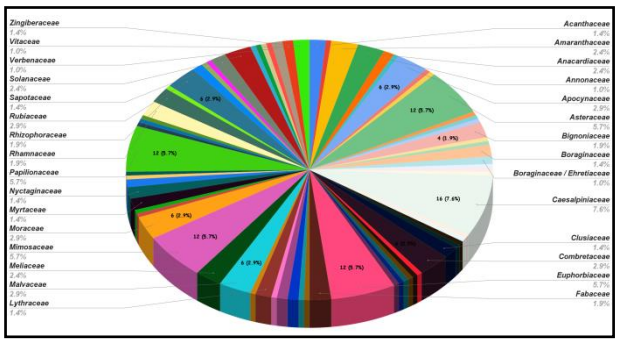

Figure 2: Family wise distribution of dye-yielding plants of Gujarat, India

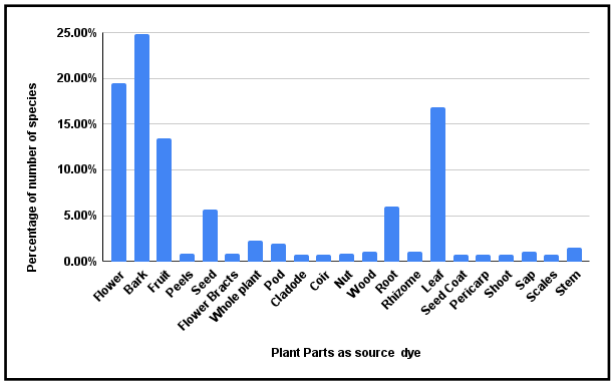

Figure 3: Percentage of number of species that yield dye from different parts of plant.

Only two reports exist on dye-yielding plants of Gujarat; Jadeja et al. 2006 reported 27 dye-yielding plants belonging to 13 families used by the ethnic communities of Porbandar district, and Patel & Patel 2017, recorded 20 dye-yielding species belonging to 15 families for the patola sari painting. Consolidated studies on dye-yielding species of India; Gokhale et al. 2004 reported 125, and Siva 2007 recorded 88 dye-yielding plant species. The study on dye-yielding resources of Assam for dyeing handloom products reported similar families, Euphorbiaceae, Rubiaceae, Caesalpiniaceae, and Combretaceae, upholding a higher number of species.

The investigation of dye-yielding plants of natural dyes revealed maximum amount extracted from bark, followed by leaf, fruit, and flower, comparable with our findings (Rani et al. 2002). In our study, we noted that the dyes from plants mainly belong to Flavone (29%), Tannin (24%), Anthocyanin (18%), Anthraquinone (10%), Carotenoid (6%), Indigoid (3%), Betalain (3%). Iso-quinone, Napthoquinone, and Benzoquinone (2%). In accordance with our results, Aggarwal S., 2021 also verified that the 18 large class subdivided into seven types, flavones, isoflavones, flavanones, anthocyanin, anthocyanidin, and proanthocyanidins (Fig. 4).

The dyes from the plant resources are mainly explored as textile dyes (52%), followed by food colorants (16 %), cosmetic dye and mordants (6%), pH indicator dyes, and leather dye (4%), chromosomal stain (3%), Histological dye (2%), and the rest of the uses, paints, inks, hand tattoo dye, wood staining, paper dyeing, batik dye, dyeing fishing nets and mats, and calico painting (1%)(Fig 5). A recent review stated that the dyes from plant resources are commonly used for dyeing fabrics because the art of dyeing has been known to people from immemorial (Aggarwal 2021).

Furthermore, it is mentioned that tannin-based dyes require mordants; however, we noted that the tannin-containing dyes are mainly obtained from the stem or bark and are used as mordants. This observation is supported by Prabhu & Bhute 2012.

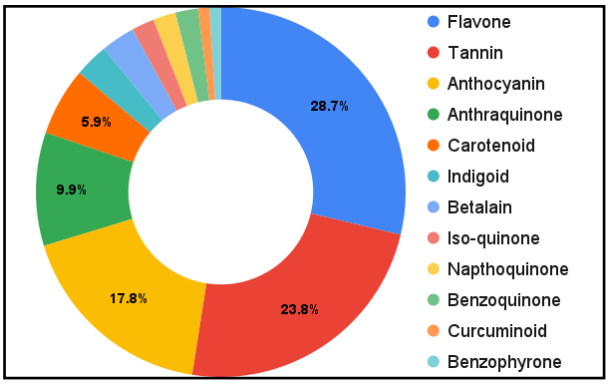

Figure 4: Percentage distribution of dye classification.

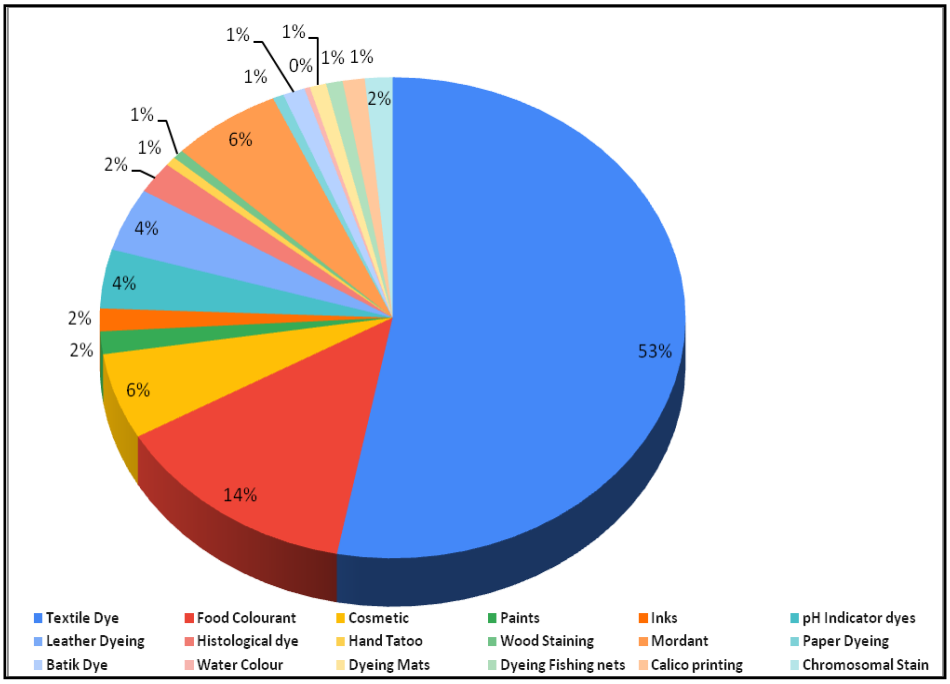

Figure 5: Percentage dyeing application of the plant dyes.

In conclusion, natural dyes are biodegradable and renewable but cannot meet the massive demand required for various industrial applications on a larger scale. The overexploitation of plant resources may cause deforestation to threaten endangered species. Hence, researchers worldwide have alleviated the shortcomings of using natural dyes because of the environmental advantages. Sustainable utilization of the plant dyes will render them economically viable. The priority for sustainable utilization is learning about the potency and availability of dye-yielding plant resources. It is evident rom the indigenous catalogue that many dye-yielding plants are unexplored, and detailed information on pigments is lacking for most resources. Since the current catalogue reports a high number of dye-yielding plant taxa, research efforts for standardized sustainable dye extraction methods, molecular characterization of pigments for various dyeing applications will enrich the commercial value of the plant dyes.

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REFERENCES

Aggarwal, S. 2021. Indian dye yielding plants: Efforts and opportunities. In *Natural Resources Forum*. Oxford, UK: Blackwell Publishing Ltd. 45(1) pp. 63-86.

Aggarwal, S., & Shukla, R. 2020. Medicinal uses of natural dye yielding plants of India. *Medicinal Plants-International Journal of Phytomedicines and Related Industries* 12(3): 442-456.

Akimpou, G., Rongmei, K., & Yadava, P. S. 2005. Traditional dye yielding plants of Manipur, North East India 4(1): 33-38.

Alawa, K. S., Ray, S., & Dubey, A. 2013. Dye yielding plants used by tribals of Dhar district, Madhya Pradesh, *India. Sci Res Rep* 3: 30-32.

Baseri, S. 2022. Ecological dyeing of cotton fabric with Matricaria recutita L. in the presence of human hair keratins as an alternative copartner to metallic mordants. *Sustainable Materials and Technologies* 32: e00405.

Bellemare, J. 2021. *"A New Creation of This Dynasty": Enamels, Glass, and the Deployment of Color in Qing China, 1700–1735*. Bard Graduate Center: Decorative Arts, Design History, Material Culture.

Benucci, I., Lombardelli, C., Mazzocchi, C., & Esti, M. (2022). Natural colorants from vegetable food waste: Recovery, regulatory aspects, and stability—A review. *Comprehensive Reviews in Food Science and Food Safety*.

Bhagat, A., Patel, K., & Jangid, M. S. 2021. Floristic diversity study of Dhansura taluka, district Aravalli, Gujarat, India. *Life Science Leaflets* 138: 13-20.

Bhatt, G. D., Kushwaha, S. P. S., & Bargali, K. 2014. Remote Sensing and GIS tools used to analyse the Floristic diversity in South Gujarat. *Remote Sensing* 3(12): 18165-18176.

Borgohain, M. P., Teron, R., & Tamuli, A. K. 2018. Natural dyes and textile as cultural marker: A study among the Tai Phake of Upper Assam, Northeast India. *Bulletin of Arunachal Forest Research 33*(2): 36-44.

Cassibry, K. 2017. The Tyranny of the Dying Gaul: Confronting an Ethnic Stereotype in Ancient Art. *The Art Bulletin* 99(2): 6-40.

Chen, B. 2022. The Craft of Color and the Chemistry of Dyes: Textile Technology in the Ryukyu Kingdom, 1700–1900. *Technology and Culture*, *63*(1): 87-117.

Choudhary, M. S., & Upadhyay, R. 2011. Observation on natural dye yielding plants of Central Narmada Valley India. *Jun. of plant development Sciences 3*: 127-131.

Coccato, A., Mazzoleni, P., Spinola, G., & Barone, G. 2021. Two centuries of painted plasters from the Lateran suburban villa (Rome): investigating supply routes and manufacturing of pigments. *Journal of Cultural Heritage* 48: 171-185.

Correa, M. E. 2021. Fashion, Design and Sustainability. New Horizons in the Ways of Conceiving Production Processes. *In Sustainable Fashion and Textiles in Latin America*. Springer, Singapore pp. 219-237.

Das, H., & Kalita, D. 2016. Fibers and dye yielding plants of north East India. In *Bioprospecting of indigenous bioresources of north-east India*. Springer, Singapore pp. 77-99.

Decelles, C. 1949. The story of dyes and dyeing. Journal of chemical education 26(11): 583.

Elsahida, K., Fauzi, A. M., Sailah, I., & Siregar, I. Z. 2019. Sustainability of the use of natural dyes in the textile industry. In *IOP Conference Series: Earth and Environmental Science*: IOP Publishing 399(1):p12065

Field, J. F. 2019. *The History of Europe in Bite-Sized Chunks*. Michael O'Mara Books.

Ghosh, C., & Das, A. P. 2007. Use of dye yielding plants by the tribal Tea Garden workers in Terai and Hills of Darjiling. *Pleione* 1(1): 19-22.

Gokhale, S. B., Tatiya, A. U., Bakliwal, S. R., & Fursule, R. A. 2004. Natural dye yielding plants. *Indian Journal of Natural Products and Resource* 3(4): 228-234.

Hamdy, D. M., & Hassabo, A. G. 2021. Various Natural Dyes from Different Sources. *Journal of Textiles, Coloration and Polymer Science* 18(2): 171-190.

Ishnava, K., Ramarao, V., Mohan, J. S. S., & Kothari, I. L. 2011. Ecologically important and life supporting plants of little Rann of Kachchh, Gujarat. *Journal of Ecology and the Natural Environment* 3(2): 33-38.

Jadeja, B. A., Odedra, N. K., & Jotva, V. K. 2006. Traditional dye yielding plants of Porbandar district, Gujarat. *Int J Plant Sci* 1(2): 190-192.

Kar, A., & Borthakur, S. K. 2008. Dye yielding plants of Assam for dyeing handloom textile products. *Indian Journal of Traditional Knowledge* 7(1): 166-171

Karapanagiotis, I. 2019. A review on the archaeological chemistry of shellfish purple. *Sustainability*, 11(13): 3595.

Krishnamurthy, K. V., Siva, R., & Senthil, T. K. 2002. Natural dye-yielding plants of Shervaroy Hills of Eastern Ghats. In *Proceedings of National Seminar on the Conservation of the Eastern Ghats, Environment Protection Training and Research Institute, Hyderabad:* 151-153.

Kumari, P. 2021. *Innovation in Design of Traditional Mashru Textile for Product Diversification* (Doctoral dissertation, Maharaja Sayajirao University of Baroda (India)).

Mahanta, D., & Tiwari, S. C. 2005. Natural dye-yielding plants and indigenous knowledge on dye preparation in Arunachal Pradesh, northeast India. *Current science*: 1474-1480.

Mansour, R. 2018. Natural dyes and pigments: Extraction and applications. *Handbook of renewable materials for coloration and finishing* 9: 75-102.

Morales-Oyervides, L., Ruiz-Sánchez, J. P., Oliveira, J. C., Sousa-Gallagher, M. J., Méndez-Zavala, A., Giuffrida, D., ... & Montañez, J. 2020. Biotechnological approaches for the production of natural colorants by Talaromyces/Penicillium: A review. *Biotechnology Advances* 43: 107601.

Nagar, P. S. 2005. Floristic biodiversity of Barda Hills and its surroundings. Scientific Publishers.

Nandy, D. 2021. Prospect of Tribal Art Market in India: A Brief Scenario. *Subaltern Perspectives in Indian Context: Critical Responses* 113.

Patel, N., & Patel, N. 2017. Study of plant uses in Patola making. *Life Sciences Leaflets* 93: 33-41.

Patel, Y., Prajapati, D. N., Patel, N. D., & Pandya, H. A. 2014. Research article Floristic Diversity Study of Kalol taluka, Panchmahal, Gujarat, India. *International Journal of Recent Scientific Research* 5(11): 2089-2094.

Patil, S. H., Kurlapkar, D. D., & Gaikwad, D. K. 2019. Dye-yielding plant resources of Maharashtra, India: A checklist. *Biodiversitas Journal of Biological Diversity* 20(1): 250-266.

Potsangbam, L., Ningombam, S., & Laitonjam, W. S. (2008). Natural dye yielding plants and indigenous knowledge of dyeing in Manipur, Northeast India. *Indian Journal of Traditional Knowledge* 7(1): 141-147.

Rani, S. S., Murthy, K. S. R., & Pullaiah, T. 2002. Dye yielding plants of Andhra Pradesh, India. *Journal of Economic and Taxonomic Botany* 26: 739-749.

Rao, V. H. 2015. A floristic and ethnobotanical survey of kaprada hilly forest and umbergaon coastal talukas of Valsad district.

Rashid, A. 2013. Dye yielding plant diversity of district Rajouri Jammu and Kashmir state-India. *Int J Pharm Bio Sci* 4(1): 263-266.

Saha, A., & Basak, B. B. 2020. Scope of value addition and utilization of residual biomass from medicinal and aromatic plants. *Industrial Crops and Products* 145: 111979.

Samant, S. S., Kumari, P., Puri, S., Singh, A., & Rathore, S. 2019. Diversity, indigenous uses and traditional practices of dye yielding plants in Central Himachal Pradesh, North western Himalaya. Indian *Journal of Traditional Knowledge (IJTK)* 18(3): 560-564.

Samanta, P., Singhee, D., & Samanta, A. K. 2018. Fundamentals of natural dyeing of textiles: pros and cons. *Current Trends in Fashion Technology Textile Engineering* 2: 001-008.

Sanda, B., & Liliana, I. 2021. Natural dye extraction and dyeing of different fibers: a review. *Innovative and Emerging Technologies for Textile Dyeing and Finishing*: 113-135.

Senthilkumar, P., & Murugesan, A. 2022. Biotechnological approaches in dyeing of textile materials. In *Applications of Biotechnology for Sustainable Textile Production* (pp. 135-162). Woodhead Publishing.

Sharda, N. L., & Rastogi, D. 2013. Unexplored treasure of the Garhwal Himalayas: Dye yielding plants for sustainable dyeing. *J Acad Ind Res* 2: 155-159.

ShetVerenkar, N. G. 2021. *Screening, Evaluation, Characterization of Potential Biological Stains and Textile Dyes of Plant Origin* (Doctoral dissertation, Goa University).

Siva, R. 2007. Status of natural dyes and dye-yielding plants in India. *Current science*: 916-925.

Srivastava, S. K., & Gautam, R. P. 2014. Inventorisation and documentation of dye yielding plant diversity of Eastern Uttar Pradesh. *International Journal of Research in Engineering and Bioscience* 2(5): 70-75.

Stamkou, E., van Kleef, G. A., & Homan, A. C. 2018. The art of influence: When and why deviant artists gain impact. *Journal of Personality and Social Psychology 115*(2): 276.

Sutradhar, B., Deb, D., Majumdar, K., & Datta, B. K. 2015. Traditional dye yielding plants of Tripura, Northeast India. *Biodiversitas Journal of Biological Diversity* 16(2).

Tadvi, D. S. 2014. *Floristic diversity of Dangs, Gujarat* (Doctoral dissertation, PhD Thesis, Department of Botany, The Maharaja Sayajirao University of Baroda, Vadodara, 37–167pp).

Uddin, F. 2021. Environmental hazard in textile dyeing wastewater from local textile industry. *Cellulose* 28(17): 10715-10739.

Vediya, S. D., & Kharadi, H. S. 2011. Floristic diversity of Isari zone, Megharj range forest District Sabarkantha, Gujarat, India. *International Journal of Pharmacy & Life Sciences* 2(9).

Verenkar, N. G., & Sellappan, K. 2018. Some potential natural dye yielding plants from the State of Goa, India. *Indian Journal of Natural Products and Resources (IJNPR)* [Formerly Natural Product Radiance (NPR)] 8(4): 306-315.

Wani, Z. A., Samant, S. S., & Pant, S. 2021. Diversity, utilization pattern and representativeness of dye yielding plants in North Western and Western Himalaya, India: an untapped source for Bioprospection. *Environment, Development and Sustainability*: 1-18.

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Table 1. Inventory of species reported for the present study.

Family Name	Botanical name	Vernacular name	Parts used	Dye color	Dye Classification	Dyeing Application	Distribution in Gujarat	References For Dyeing Application
Acanthaceae	*Barleria prionitis L.*	Kanta-shelio	Flower	Yellow	Anthroquinone	Textile Dye	Throughout (except Kutch) in forest undergrowth	Pal, A. et al., 2018
Acanthaceae	*Justicia adhatoda L.*	Ardusi	Leaf	Yellow	Iso-quinoline	Food Colorant, Textile Dye	Usually found as a hedge plant along roadsides	Rather, L. et al., 2019
Acanthaceae	*Ruellia tuberosa L.*	Fatakdi	Flower	Blue-Grey	Anthocyanin	Textile Dye, pH indicator	Found in some places as a weed in gardens and cultivated fields.	Meelapsom, R. et al., 2022
Agavaceae	*Agave americana L.*	Ketki, Vilayati	Leaf	Yellow	Flavone	Textile dyeing	Planted in hedges around fields	Batool, F. et al., 2021
Amaranthaceae	*Achyranthes aspera L. var. aspera*	Aagjada, Anghedi	Whole plant	Black-Brown	Benzoquinone	Textile dye	Throughout Gujarat	Nazir, A., et al., 2016
Amaranthaceae	*Amaranthus hypochondriacus L.*	Katai Chauli	Flower	Red, pink-purple	Betalain	Food Colorant	Ornamental Plant in gardens	Usmonjonova, H. et al., 2020
Amaranthaceae	*Amaranthus spinosus L.*	Jangli Tandaljo	Root	Pink	Betalain	Food Colourant	Common throughout Gujarat	Stintzing, F. C. et al., 2004
Amaranthaceae	*Celosia argentea L.*	Lambdi	Flower	Pink, Red	Anthocyanin	Textile dye, Food colourant	Gujarat (Throughout, everywhere, scattered or subgregarious).	Cai, Y. et al., 2001
Amaranthaceae	*Spinacia oleracea L.*	Paalak	Leaf	Green	Carotenoid, Chlofrophyll	Food Colourant	Common throughout	Hussin, S. H. A. S., 2021

Anacardiaceae	*Anacardium occidentale L.*	Kaju	Pericarp of fruit	Light Red	Anthocyanin	Textiles, Inks	Planted at some places; also grown by forest department in some forest divisions	Razak, R. et al., 2017
Anacardiaceae	*Lannea coromandelica (Houtt.) Merr.*	Mandhol, Modhad,	Bark	Golden & pale brown	Tannin	Textile Dye	Common throughout deciduous forests	Rahayu, M. et al., 2020
Anacardiaceae	*Mangifera indica L.*	Aambo, Keri	Fruit, Peels, Bark	Yellow, Brown	Carotenoid	Textile dye, Food Colorant, Leather Dye	Extensively cultivated for its fine fruits	Win, Z. M., & Swe, M. M., 2008
Anacardiaceae	*Semecarpus anacardium L. f.*	Bibba, Bhilva	Nuts	Black	Flavone	Textile dye	Throughout presidency in dry forests in Dangs	Bhattarai, B. et al., 2020
Anacardiaceae	*Spondias pinnata (L. f.) Kurz.*	Khatambo, Ambado	Fruit	Black	Flavone	Textile Dye	widely planted, In deciduous forests of Dangs and Panchmahal's	Angami, T. et al., 2020
Annonaceae	*Annona reticulata L.*	Ramfal	Fruit, Shoot	Bluish Black	Quinone	Textile Dye	Usually cultivated or planted, occasionally as an escape	Rajesh, Y., Nita, Y. & Dhar, K. M., 2014
Annonaceae	*Annona squamosa L.*	Anuri, Sitafali	Fruit	Yellow	Benzoquinone	Textile	Commonly cultivated throughout the area in the plains	Reddy, B. S., 2012
Apiaceae	*Daucus carota L. var. sativa DC.*	Gajjar, Ratadiyu	Root	Orange	Carotenoid	Food Colourant, Histological dye,	Cultivated in the gardens	Raees-ul, H. & Prasad, K., 2018
Apocynaceae	*Holarrhena pubescens Wall. ex G. Don*	kadavo indrajav	Leaf	Greenish brown	Napthoquinone	Hand tattoo	Common throughout the state in dry deciduous and semi- evergreen forests	Ali, S. G. et al., 2018

Apocynaceae	*Nerium oleander L.*	Lal karen, Karen	Flower	Pinkish- Purple	Anthocyanin	Textile dye, Wood staining	Planted on road sides and gardens as ornamental plants.	Selvam, R. M. et al., 2015
Apocynaceae	*Rauvolfia tetraphylla L.*	Sarpgandha	Fruit	Black	Flavone	Textile Dye	Gujarat as an escape at some places in Baroda, Surat, Bulsar	Kar, A., & Borthakur, S. K., 2008
Apocynaceae	*Tabernaemontana divaricata (L.) R.Br. ex Roem. &Schult.*	Sagar	Fruit Pulp	Red	Flavone	Textile dye	Grown in the gardens	Sreeremya, S., 2016
Apocynaceae	*Wrightia arborea (Dennst.) Mabberley*	Dudhlo	Seed, Root	Yellow	Tannin	Wool staining	Common in moist forests	Khyade Mahendra, S.& Nityanand, V., 2014
Apocynaceae	*Wrightia tinctoria R.Br.*	Mitho dudhalo	Leaf	Blue	Indigoid	Textile dye	In deciduous forests; common; very rarely in scrub forests.	Saivaraj, S. et al., 2019
Aracaceae	*Cocos nucifera L.*	Nariel, Tarafoo	Coir	Brown	Tannin	Textile dye	Planted at some places, Forest areas	Adeel, S. et al., 2021
Arecaceae	*Areca catechu L.*	Sopari	Nut	Brown	Tannin	Food Colourant, Textile Dye	Cultivated in north Gujarat, south Gujarat and	Kabir, S. M. M. et al., 2006
Asteraceae	*Artemisia nilagirica (Clarke) Pamp.*	Nagdaman	Leaf	Brown	Flavone	Textile dye	plant grows throughout the hilly regions of Gujarat	Nayeema, M., 2017
Asteraceae	*Caesulia axillaris Roxb.*	-	Whole Plant	Brown	Flavone	Food Colourant	throughout in damp laces & drying moist ground, at times gregarious.	Prabhu, K. H., & Bhute, A. S., 2012
Asteraceae	*Carthamus tinctorius L.*	kusum, kusumbha	Flower	Yellow, Red	Benzoquinone	Food Colourant, Textile dye, Mordant	Cultivated in gardens.	Adeel, S. et al., 2020

Asteraceae	*Coreopsis tinctoria Nutt.*	Golden Tickseed	Flower	Yellow	Flavone	Leather dyeing	ornamental; seldom a weed in waste places.	Velmurugan, P. et al., 2016
Asteraceae	*Cosmos bipinnatus Cav.*	Surangi	Flower	Yellow	Flavone, Anthocyanin	Textile dye	Ornamental; also grows along roadside	Mukherjee, S. & Kanakarajan, S., 2017
Asteraceae	*Eclipta prostrata L.*	Bhangro, Babri	Leaf	Black	Flavone	Food Colourant, Hair dye	Throughout in damp places	Keerthika, A. et al., 2015
Asteraceae	*Helianthus annus L.*	Surajmukhi	Flower	Yellow, Violet	Flavone	Textile dye	Planted in gardens, also cultivated at some places	Arroyo Figueroa, G. et al. 2021
Asteraceae	*Parthenium hysterophorus L.*	Gajar ghas	Leaf	Light green	Chlorophyll	Textile dye	Dangs, Bharuch, Rajpipla (Netrang), central Gujarat & North Gujarat	Dayal et al., 2008
Asteraceae	*Sphaeranthus indicus L.*	Gorakh Mundi	Flower	Light green	Flavone	Textile dye	In Gujarat Throughout in drying moist ground; common, when gregarious	Choudhary, M. S. & Upadhyay, R., 2011
Asteraceae	*Tagetes erecta L.*	Galgota	Flower	Orange	Carotenoid	Textile dye, Leather dye	Planted in Garden or cultivated	Shabbir, M., Rather, L. J. & Mohammad, F., 2018
Asteraceae	*Tagetes patula L.*	Gulgoto, Gul jahro	Flower	yellowish orange	Carotenoid	Food colourant, Textile dye	Planted or Cultivated in gardens	Bhattacharyya, S. et al., 2010
Asteraceae	*Wedelia chinensis (Osbeck) Merr.*	Pitabhrang	Root	Black	Flavone	Mordant, Paints Hair dye	Dangs (Malegaon-Saputara) & Vyara, rare	Meena, A. K., et. al., 2011
Averrhoaceae	*Averrhoa carambola L.*	Kamarakh	Fruit	Yellow-brown	Flavone, Benzoquinone	Mordant	Cultivated in many tropical and sub-tropical areas of Gujarat	Deepak, M. S. & Omman, P., 2013

Balsaminaceae	*Impatiens balsamina Linn.*	Takmaria, Gulmendi,	Flower	Red	Anthocyanin	Food Colorant, Cosmetic Dye, Textile dye	Saurashtra, Kachchh, Pavagadh	De O Pires, E. et al., 2021
Basellaceae	*Basella alba L.*	Poi	Seed	Purple	Betacyanin	Textile dye, Cosmetic dye, pH indicator dye, Food Colourant	Cultivated, at some places	Izonfuo, W. A., et al., 2006
Bignoniaceae	*Kigelia africana (Lam.) Benth.*	-	Bark, Root	Grayish brown	Naphthoquinones	Textile dye	Planted in gardens & along roads at many places.	Singh, A. et al., 2021
Bignoniaceae	*Oroxylum indicum (L.) Vent.*	Tetu, Aralu	Bark, Fruit	Black	Flavone	Mordant	In deciduous forests of Dangs, Vyara, Rajpipla, Chhotaudepur & Panchmahals	Sowjanya, K. et al., 2019
Bignoniaceae	*Spathodea campanulata P. Beauv.*	-Ragtoora	Flower	Orange	Anthocyanin & Carotenoid	Textile dye	Planted in gardens & along road sides.	Lokesh, P. & Swamy, M. K.,2013
Bignoniaceae	*Tecoma stans (L.) H. B. & K.*	Pidya	Flower	brownish yellow	Flavone	Textile dyeing	Planted in gardens and naturally found in forested areas	Chandra, M. S. et al., 2012
Bixaceae	*Bixa orellana L.*	Sindur	Fruti Pulp	Orange, Red	Carotenoid	Cosmetic Colorant (Sindur), Dyeing silk	Cultivated in some places	Vilar, D. D. A. et al., 2014
Bombacaceae	*Bombax ceiba L.*	Semdo, Savar	Flower	Orange, Red	Flavone	Used for dyeing silk, cotton	Throughout in deciduous & scrub forests	Chaudhary, P. H. & Khadabadi, S. S., 2012
Boraginaceae	*Ehretia laevis Roxb.*	Dant-Rang, Vadhavaradi	Bark	Red	Flavone	Food Colouant	Gujarat (at many places except for the following N. Gujarat & Dharampur	

Boraginaceae	*Heliotropium indicum L.*	Hathi Sundha	Leaf	Yellow	Flavones	Dyeing Cotton	Marshlands	Aggarwal, S., 2021
Boraginaceae	*Heliotropium strigosum Willd.*		Leaf	Black	Naphthoquinones	Textile Dye	Gujarat; Saurashtra	Patil, S. H., Kurlapkar, D. D., & Gaikwad, D. K., 2019
Boraginaceae / Ehretiaceae	*Cordia domestica Roth.*	Gunda	Root, Leaf	Yellow, Red	Naphthoquinones	Painting nails	Infrequent in deciduous forest. Saurashtra, Panchmahal & Chottaudepu.	Murthy, K. et al., 2020
Boraginaceae / Ehretiaceae	*Cordia sebestena L.*	Lal Lasora	Flower	Red	Anthocyanin	Textile dyeing	Occasionally grown in gardens.	Kumaresan, M., Palanisamy, P. N., & Kumar, P. E., 2013
Brassicaceae	*Brassica oleracea L. var. botrytis L.*	Gobi, Fulevar	Flower	Pink	Anthocyanin	Dyeing wool and silk	Cultivated in many places for its flowers which are used as vegetables.	Haddar, W. et al., 2018
Burseraceae	*Garuga pinnata Roxb.*	Kakad	Leaf	Red	Anthocyanin	Textile dye	Throughout in the deciduous forests	Prabhu, K. H. & Bhute, A. S.,2012
Cactaceae	*Opuntia ficus-indica (L.) Mill.*	Hathlo thor	Cladode	Pink-Red	Betalains	Dyeing wool, also as food colouring	mainly grows in arid and semiarid zones.	Otálora, M. C. et al., 2019
Caesalpiniaceae	*Bauhinia purpurea L.*	Champa	Bark	Purple	Flavone	Dyeing textiles	Wild throughout deciduous forest and also planted in gardens.	Marpaung, A. M., 2020
Caesalpiniaceae	*Bauhinia racemosa Lam.*	Asitro, Zenzvo	Bark	Light-green	Flavone	Textile Dyeing	Throughout in deciduous and scrub forest.	Kaushalya, P. G. & Wimalaweera, W. A., 2021

Caesalpiniaceae	*Bauhinia tomentosa L.*	Pido Kachnar	Leaf	Yellow	Flavone	Food Colorant	Abundant & wild in Saurashtra, rare in North Gujarat	Orwa, C. et al., 2009
Caesalpiniaceae	*Bauhinia variegata Linn.*	Kachnar	Bark	Yellow	Flavone	Textile dye	Planted throughout Gujarat	Aggarwal, S., 2021
Caesalpiniaceae	*Bauhinia. vahlii Wight & Arn.*	Mahulivel	Bark	Brown, Black	Tannin	Cotton dyeing	In moist deciduous forests.	Bar, G. & Bar, M., 2020
Caesalpiniaceae	*Caesalpinia coriaria (Jacq.) Willd.*	Divi-Divi	Fruit	Brown, Black	Tannin	Mordants	Planted along roads and gardens.	Singh, S. & Singh, D. R., 2018
Caesalpiniaceae	*Caesalpinia pulcherrima (L.) Sw.*	Shankhasur, Galtora	Flower	Red	Anthocyanin	dyeing textiles	As ornamental, not apparently wild	Bharati , K. T. et al., 2017
Caesalpiniaceae	*Caesalpinia sappan L.*	Patanga	Bark, Sapwood, Pod	Red, Black	Anthocyanin	Paper dyeing, Cosmetic dye, Textile dyeing, Paints & Inks, Histological Dye	Planted in the gardens.	Datta, M. K. et al., 2021
Caesalpiniaceae	*Cassia fistula L.*	Garmalo, Kasundro	Bark, Pod	Orange Yellowish-Brown	Tannin	Dyeing nylon and silk fabrics	Throughout in deciduous forests; also planted along roads and in gardens	Rattanaphol, M. et al., 2015
Caesalpiniaceae	*Cassia tora L.*	Kuvandio, Pochandio	Seed	Blue	Anthraquinone	Dyeing and Tanning	Throughout common, scattered or subgregarious.	Hwang, E. K., Lee, Y. H., & Kim, H. D., 2008
Caesalpiniaceae	*Delonix regia (Boj.) Raf.*	Gulmohor	Flower	Orange-red	Anthocyanin & Carotenoid	Silk dyeing	Planted in gardens and along road sides	Vankar, P. S. & Shanker, R.,2009

Caesalpiniaceae	*Peltophorum pterocarpum (DC.) Backer ex K. Heyne*	Tamrafali	Pod	Reddish-Brown	Tannin	Colouring Batik	Planted in gardens and along roads	Sudarmin, S. et al., 2020
Caesalpiniaceae	*Senna alata (L.) Roxb.*	Dadmurdan	Seed	Black	Anthraquinone	Textile dye	Planted	Shah, M. R. & George, I. A., 2019
Caesalpiniaceae	*Senna auriculata (L.) Roxb.*	Aawala, Aaval	Fruit, Seed, Flower	Red, Orange, Yellow	Tannin	Leather dyeing, Textile Finishing	Along the drier tracts in open situations	Lim, T. K., 2014
Caesalpiniaceae	*Senna occidentalis (L.) Link*	Kasundaro	Seed	Brown	Anthraquinone	Textile dyeing	Along roadsides and waste lands	Chilukoti, G. R. et al., 2020
Caesalpiniaceae	*Tamarindus indica L.*	Amli	Seed Coat	Brown	Tannin	Mordant	throughout planted or self sown, rarely wild in dense forest.	Prabhu, K. H. & Teli, M. D., 2014.
Caricaceae	*Carica papaya L.*	Papaiya	Leaf	Green	Flavone, Anthraquinone	Edible dyes, Mordant,	Cultivated throughout	Rusdi, S. et al., 2020
Casuarinaceae	*Casuarina equisetifolia L.*	Sharu	Bark	Light Red	Tannin	Mordant, silk dyeing	Extensively planted along sea shore for soil reclamation, also ornamental	Swamy, V. N. , 2017
Chenopodiaceae	*Beta vulgaris Linn.*	Beet	Root	Red	Betacyanin	Edible dyes, Cosmetic Dyes, Textile dyeing	Cultivated in north gujarat	Ninfali, P. & Angelino, D., 2013
Cladoniaceae	*Cladonia verticillata (Hoffm.) Schaer.*	-	Whole plant	Yellow- Red	Iso-quinoline	Textile dyeing	Common throughout	Allen, J. L. & Lendemer, J. C., 2021

Clusiaceae	*Garcinia indica Choisy*	kokam	Fruit Rind	Red	Anthocyanin	Food dye, Mordant , textile dyeing	Coastal regions	Hegde, M. G., Bai, S. K. & Vijayeendra, M. K.,2011
Clusiaceae	*Garcinia mangostana L.*	Mangustan	Peels	Dark Red	Anthocyanin	Textile and Leather dyeing	Common throughout coastal regions	Kurinjimalar, C. et al., 2022
Clusiaceae	*Garcinia xanthochymus Hook. f*	-	Fruit	Yellow	Iso-quinoline	Textile dye, Food Colourant, Water colour	Common throughout coastal regions	Wickramasinghe, P. C. et al., 2020
Combretaceae	*Anogeissus latifolia (Roxb.) Wall. ex Bedd.*	Davado, Dhamod	Leaf	Black	Tannin	Mordant	Throughout in deciduous forests	Singh, S. & Singh, D. R., 2018
Combretaceae	*Terminalia arjuna (Roxb.) W. & A.*	Panisadad, Arjunsadad	Bark	Reddish Khaki	Tannin	Textile dye, mordant	Rajpipla, Chhota Udepur, Panchmahals, N. Gujarat; Balaram, Ambaji; Saurashtra; not frequent.	Amutha, K. & Sudhapriya, N., 2020
Combretaceae	*Terminalia bellirica (Gaertn) Roxb.*	Behda	Seed	Yellow	Tannin	Cosmetic (Hair) Dye	Frequent in moist deciduous forests.	Kapoor, V. P., 2005
Combretaceae	*Terminalia catappa L.*	Desi Badam	Leaf	Yellowish green	Tannin	Textile dye	Frequent in moist deciduous forests.	Orwa, C. et al., 2009
Combretaceae	*Terminalia chebula Retz.*	Harde	Fruit	Yellow	Tannin	Wool dye and mordant	Frequent in moist deciduous forests.	Shabbir, M. et al., 2017
Combretaceae	*Terminalia paniculata Roth*	-	Bark	Bark	Anthocyanin	Dyeing Textiles	Frequent in moist deciduous forests.	Verenkar, N. G. & Sellappan, K., 2018

Commelinaceae	*Commelina benghalensis L.*	motun Sheshmuli	Flower	Blue	Anthocyanin	Food colouring agent, Painting on transparencies	Throughout Gujarat Very widely distributed in scrub jungles, wayside puddles. Weed of arable lands, marshy. Found along streams, thickets, scrub jungles, arable lands	Vatsala, T. M. & Rekha, R., 2013
Cuscutaceae	*Cuscuta reflexa Roxb.*	Amarvel	Whole plant	Yellow	Flavone	Dyeing Silk and cotton, painting	Throughout Gujarat	Sharma, H. M., Devi, A. R. & Sharma, B. M., 2005
Cypersaceae	*Cyperus scariosus R.Br.*	Nagaramothaya	Root	Brown	Flavone	Not reported	Found in forest and swamp area	Gaur, R. D., 2008
Dioscoreaceae	*Dioscorea bulbifera L.*	Varakand, Vanavel	Tuber	Pale color	Tannin	Textile dye	Throughout Gujarat	Kagathara, M., Dalal, D. J. & Solanki, H. A., 2020
Dipterocarpaceae	*Shorea robusta Gaertn.*	Ral	Bark	Red, Black	Tannin	Silk dyeing	Cultivated as ornamental tree	Sahoo, T. et al., 2015
Ebenaceae	*Diospyros melanoxylon Roxb.*	Timru, Timbervo	Fruit	Black	Tannin	Dyeing cotton and fishing net	Throughout frequent in deciduous forest.	Upadhyay, R. & Choudhary, M. S. , 2014
Euphorbiaceae	*Acalypha wilkesiana Muell-Arg*	Copper leaf	Leaf	Red to orange	Anthocyanin	pH indicators, Dyeing silk fabrics	Planted in gardens.	Adeel S. et al., 2019
Euphorbiaceae	*Bridelia retusa (L.) Spr.*	Monj, Dantiyo	Bark	Red	Anthocyanin	Textile Dyeing	Throughout in dry deciduous forests	Sujata, Wangkheirakpam, 2014
Euphorbiaceae	*Bridelia stipularis (L.) Bl.*	Asan	Fruit	Black	Flavone	Food Colourant, Textile Dye	Found throughout Gujarat but rare in Saurashtra	Sreenivas, V. K., et al. 2011

Euphorbiaceae	*Chrozophora rottleri (Geiseler)A.Juss.ex.Spreng.*	Kalo Okharad	Seed	Blue	Indigoid	Dyeing Mats	Throughout a weed in cultivated fields & drying moistlands; common.	Keerthana, P. , 2020).
Euphorbiaceae	*Chrozophora tinctoria A. Juss.*	Kamala	Fruit, Flower, Sap	Blue-Purple	Indigoid	Food Colorants	Annual growing plants grows in tropical regions of gujarat	Oke-Altuntas, F. et al., 2017
Euphorbiaceae	*Erythrina variegata Roxb.*	Pangaro, Pangara	Flower	Red	Anthocyanin	Dyeing wool and silk	planted at some places.	Chuprayoon, S., Sirimungkarat, S., & Pojun, D., 2009
Euphorbiaceae	*Euphorbia tirucalli L.*	Kharsani	Wood ash	Auxillary	Flavone	Cotton, Silk dyeing	Throughout, as hedges; also neutralized in some places.	Senthilkumar, R. P. et al., 2015
Euphorbiaceae	*Jatropha curcas L.*	Ratan jyot	Bark, Leaf	Blue	Flavone, Tannin	Cotton dyeing	Throughout, rarely planted as a hedge or an escape.	Srivastava, S. K. et al., 2008
Euphorbiaceae	*Kirganelia reticulata (Poir.) Baill.*	Kamboi, Datvan	Bark, Root	Red	Anthocyanin	Tanning and dyeing fishing lines	Stream banks, lake shores and also in moist deciduous and semi-evergreen forests	Kharat, A. , 2013
Euphorbiaceae	*Mallotus philippensis (Lam.) Muell.-Arg.*	Kapilo, Kukhro	Fruit	Red	Anthocyanin	Dyeing textiles	deciduous forests of south and central Gujarat and Saurashtra; common at Dangs; otherwise not frequent.	Khan, S. A. et al., 2011
Euphorbiaceae	*Phyllanthus acidus (L.) Skeels*	Khataamla	Bark		Tannin	Textile dyeing		Junsongduang, A. et al., 2017

Euphorbiaceae	*Phyllanthus emblica L.*	Amla	Fruit	Brownish-Yellow	Tannin	Textile dyeing	Planted in gardens	Prabhu, K. H. et al., 2011
Fabaceae	*Abrus precatorius L.*	Khervalio Baval	Seed	Black	Anthraquinone	Mordant	Throughout on hedges and low shrubs in forests	Bako, N. A., Sabuna, A. C., & Daud, Y., 2020
Fabaceae	*Acacia pennata (L.) Willd.*	Khairvel	Bark	Brown, Black	Tannin	Wool dyeing	Gujarat; frequent in deciduous forests. Sparingly in scrub forest.	Shukla, S. R. et al., 2004
Fabaceae	*Butea superba Roxb.*	Khakhar velo	Flower	deep yellowish orange dye	Carotenoid	Dyeing cotton fabrics	Gujarat (Dangs, Saurashtra) rare.	Yadav R., Yadav N. & Kharya M.D., 2014
Fabaceae	*Trigonella foenum-graecum L.*	Methi	Seed	Brown	Flavone	Textile dye	Cultivated, also an escape	Selvam, R. M. et al., 2015
Lamiaceae	*Leucas cephalotes (Roth) Spreng.*	Khetarau Kubo, Dosi no kubo	Seed	Auxillary	Flavone	Textile dye	Throughout, scattered, common	Vasugi, N., Bagyalakshmi, G. & Prabha, R., 2020
Lauraceae	*Cassytha filiformis L.*	-	Whole plant	Brown	Tannin	Textile dye	Saurashtra & Bulsar	Ambi, A. A. et al. , 2017
Lecythidaceae	*Careya arborea Roxb.*	Kumbhi, Kumbh	Bark	Yellow	Flavone	Textile dye	In forests of Bulsar, Dangs, Vasnada & Vyara	Swamy, V. N., 2019)
Lecythidaceae	*Couroupita guianensis Aubl.*	Shivling	Fruit pulp	Blue, Pink	Anthocyanin	Ink, Textile dye	Planted in the gardens.	Tayade, P. B. & Adivarekar, R. V., 2014
Liliaceae	*Allium cepa L.*	Dongri, Kando, Pyaz	Scales	Yellow, Brown, Bright Red	Flavone	Textile dye, Food Colourant	Cultivated as a cold season crop.	Om-Hashem, A. et al., 2016

Liliaceae	*Aloe barbadensis Mill.*	Kunvar-pathu	Leaf	Red	Anthraquinone	Mordant	Throughout in waste places, scattered or subgregarious, also near houses.	El-Zairy, W., 2016
Loganiaceae	*Strychnos nux vomica L.*	Zer kachola	Seed, Fruit	Brown, Black, Blue	Flavone	Textile dye, Bait colouring	Planted at some places of Gujarat.	Patil, S. P., Pandit, P. & Laddha, K. S., 2020
Lythraceae	*Lagerstroemia parviflora Roxb.*	Bhondara, Bhondaro	Bark	Brown	Tannin	Dyeing Leather and Cotton	In deciduous forests of South & Central Gujarat	Parkhe, G. & Bharti, D. , 2019
Lythraceae	*Lawsonia Inermis*	Mehndi	Leaf	orange-red	Naphthoquinone	Hair Dye and Textile Dye	Planted as a hedge	Bhuiyan, M. R. et al., 2017
Lythraceae	*Woodfordia fruticosa (Linn.) Kurz*	Dhaiti	Leaf, Flower	Dark yellowish-brown	Tannin	Leather & Textile Dye	Common throughout	Grover, N. & Patni, V., 2011
Magnoliaceae	*Michelia champaca L.*	Sonchampo, Raichampo	Bark, Flower	Yellow, Orange	Flavone	Food Colourant	planted near temples for fragrance	Wai, M. H., & Lu, K., 2019
Malvaceae	*Althaea rosea (L.) Cav*	Gul khair, Khaini	Flower	Red	Anthocyanin	pH Indicator dye, Textile Dye, Food Colourant	An ornamental plant in gardens throughout Gujarat	Fahamiya, N. et al., 2016
Malvaceae	*Gossypium herbaceum L.*	Kapas	Flower	Yellow	Flavone, Anthocyanin	Silk and Cotton	Cultivated in almost all districts except part of Dangs and Valsad districts	Kumar, R.P. Senthil, 2015
Malvaceae	*Hibiscus rosa-sinensis L.*	Jasundi, Jasud	Flower	Red	Anthocyanin	Textile and cosmetic dyeing	Planted in gardens	Vankar, P. S. & Shukla, D., 2011

Malvaceae	*Kydia calycina Roxb.*	Warang, Waring, Moti Hirvani	Bark	Maroon	Flavone, Tannin	Silk Dyeing	Common on the Ghats	Swamy, V. & K N, Ninge & Sudhakar, Ragul., 2014
Malvaceae	*Thespesia populnea (L.) Sol. ex Corrêa*	Paras piplo, Pardeshi bhindi	Fruit	Yellow	Flavone	Dyeing fabrics	Planted in gardens & on road sides	Mohini, K., Tejashree, L., & Vijay, N., 2018
Malvaceae	*Urena lobata L.*	Vagadau Bhindo	Bark	Brown	Tannin	pH indicator dyes	Throughout; not common all tropical regions.	Babu, S. S., Madhuri, D. B., & Ali, S. L., 2016
Meliaceae	*Azadirachta indica A. Juss.*	Limdo	Bark, Leaf	Brown Green	Flavone	Textile dye	Planted throughout along roads, self sown or wild in forests and in many hot climate	Zuber, M., et al., 2019
Meliaceae	*Chukrasia tabularis A. Juss*	Lal Devdar	Flower	Red and Yellow dye	Tannin, Anthocyanin	Food Colourant	Found in lowland evergreen forests and deciduous forests	Kaur, R., & Arora, S., 2009
Meliaceae	*Melia azedarach L.*	Bakanlimdo, Bakan Nimb	Leaf	Blue	Anthraquinone	Textile dyeing	Planted throughout Gujarat	Pal, A., Kumar, R., & Tripathi, Y. C., 2016
Meliaceae	*Soymida febrifuga (Roxb.) A. Juss*	Royani	Bark	Brown, Red	Flavone	Dyes for Textile and Paper Industry	South Gujarat (Dangs, Vyara, Rajpipla), Central Gujarat (Chhotaudepur, Panchmahal), Saurashtra; occasional.	Reddy, M. C. et al., 2016
Meliaceae	*Swietenia mahogani L.*	Mahaneem	Bark	Brown	Anthraquinone	Textile dye	Grown in Saurashtra	Fatoni, R. & Fatimah, S., 2020).
Mimosaceae	*Abelmoschus esculentus (L.) Moench.*	Bhinda	Flower	Purple	Anthocyanin	Textile dye	Throughout, extensively cultivated	Fuqua, M. A., Huo, S., & Ulven, C. A., 2012

Mimosaceae	*Acacia arabica Willd.*	Baval	Bark	Brown	Tannin	Mordant	Widely planted in the Deccan	Ratnapandian, S. et al., 2012
Mimosaceae	*Acacia catechu (L. f.) wild*	Kheriyo baval	Bark	Dark Brown, Black	Tannin	Mordant, Cosmetic Dye	Throughout in deciduous forests; sparingly seen in scrub forests	Khan, M. I. et al., 2010
Mimosaceae	*Acacia chundra (Roxb. ex Rottl.)*	Safed khair	Bark	Brown	Tannin	Cosmetic Dye	Through out in decideous forests, common; spacially seen in scrub forests.	Jamagondi, L. N. et al., 2019
Mimosaceae	*Acacia farnesiana (L.) Willd.*	Tal-baval, Zeri-baval,	Bark, Fruit	Yellow	Flavone	Textile Dye	Planted for fragrant flowers; so far reported from Kachchh, Saurashtra, Vallabh Vidyanagar, Bulsar;	Kumar, R. & Tripathi, Y. C., 2011
Mimosaceae	*Acacia leucophloea Willd.*	Hermo Baval	Leaf, Bark	Red, Yellow	Flavone	Cotton dyeing	Throughout in dry deciduous forests	Sivajiganesan, S., 2017
Mimosaceae	*Acacia nilotica (L.) Del.*	Deshi baval	Bark, Pod, Fruit Rind	Dark Brown, Yellow	Tannin	Dyeing wool, Mordant, Leather dyeing	Arid and semi-arid regions	Rather, L. J. et al., 2017
Mimosaceae	*Adenanthera pavonina L.*	Ratanjali, Ratangunj	Bark	Reddish Brown	Flavone	Dyeing silk, cotton and in calico printing	Planted in gardens	Gill, P. & Singh, O. P., 2010
Mimosaceae	*Albizia odoratissima (L.f.) Benth.*	Achho Sarasdo, Dholo Sirish	Stem, Bark	Brown, Brick red	Flavone, Tannin	Cotton dyeing	Common in moist deciduous forests	Kar, A. & Borthakur, S. K., 2008
Mimosaceae	*Albizia procera (Roxb.) Benth.*	Kilai	Bark	Brown	Flavone, Tannin	Tanning and dyeing	Throughout moist deciduous forests	Ji, N. K. et al., 2007

Mimosaceae	*Pithecollobium dulce Benth*	Vilayati Ambli	Bark	Brownish-Yellow	Tannin	Tanning leather, dyeing fabric, ink	Planted in forests and in garden.	Dontharaboina S. et al., 2020
Mimosaceae	*Prosopis juliflora (Sw.) DC.*	Gando baval	Pod Husk	Yellow	Tannin	Dyeing cotton	Throughout planted along coastal region for soil reclamation.	Odero, M. P. et al., 2020
Moraceae	*Artocarpus heterophyllus Lam.*	Fanas	Wood	Brown	Flavone	Textile dyeing	Subcanopy trees in evergreen to semievergreen forests & also Cultivated throughout	Vankar, P. S. et al., 2011
Moraceae	*Ficus amplissima Sm.*	Pipali	Leaf	Brown	Flavone	Cotton Dyeing	Dangs, Pavagadh, Chhotaudepur, Panchmahals, S. gujarat, Saurashtra & Kachchh.	Kumbhar, S. et al., 2019
Moraceae	*Ficus benghalensis L.*	Vad	Bark	Red, Brown	Anthocyanin	Dyeing and Printing textiles.	Throughout wild, self-sown or planted as a shade tree.	Thakker, A. M. & Sun, D., 2021
Moraceae	*Ficus racemosa L.*	Umardo	Fruit	Red	Anthocyanin	Silk dyeing	Throughout common.	R, Sudhakar et al., 2011
Moraceae	*Ficus religiosa L.*	Pipado	Bark	Reddish Brown	Anthraquinone	Cotton and Silk Dyeing	Throughout, planted or self - sown.	Habib, N. et al., 2022
Moraceae	*Morus alba L.*	Shetur	Fruit	Reddish- Purple	Anthocyanin	Histological & Chromosomal Staining, Textile dye	Cultivated in gardens	Tousson, E. & Al-Behbehani, B., 2011
Moringaceae	*Moringa oleifera Lam.*	Saragvo	Bark	Blue	Flavone, Tannin	Food Colourant, Histological Stain	Common throughout north Gujarat	Paul, C. W. & Didia, B. C., 2012

Musaceae	*Musa paradisiaca L.*	Keda	Stem, Flower	Black, Red	Anthocyanin	Textile dye	Throughout cultivated in Gujarat.	Ammayappan, L., Kumar, G. & Krishnan, D., 2004
Myrtaceae	*Eucalyptus globulus Labill.*	Nilgiri	Bark	Brown	Tannin	Food dye	Planted in forests and in garden.	Vankar, P. S., Tiwari, V., & Srivastava, J., 2006
Myrtaceae	*Psidium guajava L.*	Jamfal	Fruit	Black-Brown	Flavone	Dyeing Textiles	Cultivated in the gardens.	Han, M. R., & Lee, J. S., 2012
Myrtaceae	*Syzygium cumini (L.) Skeels*	Jambu	Fruit	Purple	Anthocyanin	Edible dye, Histological dye,	In forest occasional; planted along roads and in gardens; self sown in waste places; Dangs.	Santiago, M. C., 2016
Nyctaginaceae	*Bougainvillea glabra Choisy*	Boganvel	Flower Bracts	Dark pink	Betalain	Dyeing Textiles, pH indicators	Cultivated along road sides	Gaurav, P. et al., 2010
Nyctaginaceae	*Bougainvillea spectabilis*	Boganvel	Flower Bracts	Pink	Betalain	Dyeing Textiles, pH indicators, Cosmetic Dye	Cultivated in the gardens.	Dutta, S., & Kumar, M. S., 2021).
Nyctaginaceae	*Mirabilis jalapa L.*	Gulbas	Flower	Pink- Red	Anthocyanin	Food Colourant	Cultivated in the gardens.	Rathi, C. R. et al., 2020
Oleaceae	*Jasminum sambac (L.) Aiton*	Jui	Flower	Yellow	Flavone, Tannin	Food Colourant	Grown in gardens, Ornamental	Lim, T. K., 2014
Oleaceae	*Nyctanthes arbortristis L.*	Parijatak, Cheddi, Harisingar	Flower	Orange	Flavone, Carotenoid, Tannin	dyeing and painting on cotton and silk	Wild at Rajpipla, Chottaudapur, Panchmahals, Mahi ravines & N. Gujarat;	Deshmukh, A. & Dongre, S., 2015

Oxalidaceae	*Oxalis corniculata L.*	Changeri, Naveri	Leaf	Yellow, Orange, Red, Brown.	Flavone, Carotenoid	Dyeing silk and Cotton	As escape in cultivated field, seen in North Gujarat (Kadi), In temperate zones	Das, P. K., 2018
Papaveraceae	*Papaver somniferum L.*	Aphin, Khas-khas	Flower	Purple	Anthocyanin	Dyeing wool	Cultivated in gardens	Arı, S., Kargıoğlu, M. & Konuk, M., 2017
Papilionaceae	*Butea monosperma (Lam.) Taub.*	Khakhro, Kesudo, Palas	Flower	Yellow or orange	Flavone, Carotenoid	Holi colours, Food Colourant, Textile & Cosmetic dye	Common throughout Gujarat,	Sinha, K., Saha, P. D. & Datta, S., 2012
Papilionaceae	*Clitoria ternatea L.*	Koyal	Flower	Blue	Anthocyanins	Textile dye, pH indicators	Throughout on hedges, Cultivated in gardens	Taif, B., 2017
Papilionaceae	*Dalbergia sissoo Roxb.*	Moto sisam, Sisu	Bark	Brown	Tannin	Textile dye	Common in kanheri Jungles & hills about Nagotna and Planted in forests	Verenkar, N. G. & Sellappan, K., 2018
Papilionaceae	*Erythrina suberosa Roxb.*	Jagraiyo-Khakharo, Janghariyo	Flower, Bark	Dark Brown	Flavone, Anthocyanin, Carotenoids	Textile dye, pH indicators	In all zones; except for the following Kachchh. Mostly near river banks in forests.	Singh, S. V. & Purohit, M. C., 2012
Papilionaceae	*Indigofera cassioides Rottl. ex DC.*	Neel	Leaf, Flower	Blue	Indigoid	Textile Dye	Ratan mahals by Dr. Bedi (1961), Junagadh-Veraval road in Saurashtra	Singh, R. & Srivastava, S., 2017
Papilionaceae	*Indigofera cordifolia B. Heyne ex Roth*	Bhakho	Flower	Black	Indigoid	Textile dye	Throughout	Aggarwal, S. & Shukla, R.,2020

Papilionaceae	*Indigofera parviflora F. Heyne ex Hook. & Arn.*	-	Leaf	Yellow	Flavone	Not reported	In the forest undergrowth at Ambadungar & Kodipani in Chhotaudepur forest division; very rare;	Gerometta, E. et al., 2020
Papilionaceae	*Indigofera tinctoria L.*	Gali, Nil Gudi	Whole plant	Blue	Indigoid	Food Colorant, Textile dye	Reported from Saurashtra, Bharuc	Pattanaik, L., et al., 2020
Papilionaceae	*Pongamia pinnata (L.) Pierre*	Karanj	Seed	Brown	Flavone	Dyeing textiles	Common throughout Gujarat,	Orwa, C., et al., 2009
Papilionaceae	*Pterocarpus marsupium Roxb. var. acuminatus Prain*	Biyo	Bark	Brick- red	Flavone	Dyeing silk	In deciduous forest	Das, P. K., Mondal, A. K. & Parui, S. M., 2011
Papilionaceae	*Tephrosia candida DC.*	-	Leaf	Red, light blue	Flavone	Textile dyeing	Cultivated in gardens	Das, H. & Kalita, D., 2016
Papilionaceae	*Tephrosia purpurea (L.) Pers*	Sarpankho, Ghodakan	Leaf	Orange-Brown	Flavone, Tannin	Textile dyeing	Throughout common; Chandod, Dessa, Baroda	Orwa, C. et al., 2009
Piperaceae	*Piper betle L.*	Nagarvel	Leaf, Root	Blue	Benzophyrone	Dyeing Cotton and silk, Cosmetic dyeing	Commonly found in deciduous forests	Huong, B. M. & Hue, T. T. K., 2019
Proteaceae	*Grevillea robusta Cunn. ex R. Br.*	Silver Oak	Flower	Yellow	Flavone	Textile dye	Ornamental in garden & along roads	Yıldırım, F. F. et al., 2020
Punicaceae	*Punica granatum L.*	Dadam	Flower, Fruit Rind	Yellow/Red	Tannin	Dyeing textiles, cosmetics	Cultivated at some places e.g. Bhavnagar district in Gujarat.	Kasiri, M. B., & Safapour, S., 2014

Rhamnaceae	*Ventilago denticulata Willd.*	Asi, Asvel	Bark, Root	Violet	Anthraquinone	Dyeing cotton, wool and tasar silk	in deciduous forests of South & Central Gujarat;	Thakker, A. & Sun, D., 2021
Rhamnaceae	*Ventilago madraspatana Gaertn.*	Ragatarohado	Root, Bark	Chocolate	Anthraquinone	Dyeing Cotton & Silk	mainly in evergreen forests and rarely in deciduous patches.	Sharma, M. et al., 2006
Rhamnaceae	*Ziziphus jujuba Mill.*	Bordi	Fruit	Reddish Pink	Anthocyanin	Dye wool and silk and Tan leather	In semi-deciduous forests	Bussmann, R. W. et al., 2020
Rhamnaceae	*Zizyphus mauritiana Lam.*	Bordi	Leaf, Bark	Pinkish Red	Anthraquinone	Tanning	tropical and sub-tropical regions	
Rhizophoraceae	*Bruguiera gymnorhiza (L.) Savigny*	Sanvar	Bark	Reddish Brown	Flavone, Quinone	Leather Dyeing	in sea creek at Navlakhi in Saurashtra (Santapau, 1962). Common all along the sea-loart and in salt-marshes	Musara, C., Aladejana, E. B., & Mudyiwa, S. M., 2020
Rhizophoraceae	*Ceriops tagal (Perr.) C.B. Rob.*	Kikari	Bark	Black	Tannin	Batik, tanning, dyeing textiles	muddy shores and tidal creeks	Verenkar, N. & Krishnan, S., 2017
Rhizophoraceae	*Rhizophara apiculata Bl. Enum.*	Samudra rai	Bark	Reddish-brown	Tannin	Tanning leather, dyeing fishing lines, ropes and nets, silk	It grows gregariously in swamps flooded by normal high tide, on deep soft mud of estuaries	Mongkholrattanasit, R. et al., 2013
Rhizophoraceae	*Rhizophora mucronata L.*	Karod, Kanda	Bark	Chocolate	Tannin	Batik Textiles	Along the sea coast-near Bulsar, Saurashtra and Bulsar. India;	Pringgenies, D. et al., 2021
Rosaceae	*Rosa indica L.*	Gulab	Flower	Pink	Anthocyanin	Textile dyeing, leather dyeing, Food	Planted in gardens	Adeel, S. et al., 2021

						colourant, pH indicator		
Rubiaceae	*Hymenodictyon orixense (Roxb.) Mabb.*	Amarchala, Dondro	Leaf	Yellow	Anthraquinone	Textile Dyeing	Infrequent in decidouous forests.	Razafimandimbison, S. G. & Bremer, B., 2006
Rubiaceae	*Ixora coccinea L.*	Nevri	Flower	Red	Anthocyanin	Cosmetic and Textile dyeing	Cultivated in gardens for its beautiful scarlet flowers.	Patil, N. N. & Datar, A. G., 2016
Rubiaceae	*Morinda citrifolia L.*	Surangi, Noni	Root	Red	Anthraquinone	Textile Dyeing, Food Colourant	Planted at some places in Gujarat.	Tapp, W. N. et al., 2012
Rubiaceae	*Morinda pubescens Sm.*	Aal	Root, Stem, Bark	Yellow, Red	Anthraquinone	Textile dyeing	Throughout (except Kachchh) common in dry deciduous forests	Karupasamy, K. et al., 2016
Rubiaceae	*Oldenlandia umbellata L.*	Parpati	Root	Red	Anthraquinone	pH indicator, textile dyeing	Ahmedabad, Saurashtra & Kachchh	Ramamoorthy, S. et al., 2009
Rubiaceae	*Rubia cordifolia L.*	Majitha	Bark	Red	Anthraquinone	Dyeing Textiles		Vankar, P. S. et al., 2017
Rutaceae	*Aegle marmelos (L.) Corr.*	Bili	Fruit Rind	Yellow	Carotenoids, Tannin	Dyeing wool and linen, Calico Printing	Throughout in deciduous & scrub forest; common & also planted in garden	Kala, C. P., 2006
Rutaceae	*Citrus medica var limetta Wt. & Arn.*	Mitha limbu	Bark	Black, Blue	Flavone, Tannin	Textile dyeing	Cultivated in some areas of the Gujarat	Das, S. et al., 2021
Santalaceae	*Santalum album Lam.*	Chandan, Sukhad	Wood	Red	Flavone, Tannin	Dyeing Textiles	Planted, seldom wild	Baruah, S. & Gaikwad, A., 2013

Sapindaceae	*Dodonaea viscosa Jacq.*	Lakhmi, Jakhami	Bark, Leaf	Yellow, Brown	Flavone	Textile dye	planted as a hedge at some places throughout the presidency, chiefly in dry open situations,	Rani, M. S., Pippalla, R. S. & Mohan, K., 2009
Sapotaceae	*Madhuca longifolia (Koen.) MacBride*	Mahuda	Bark	Brown	Flavone	Silk Dyeing	Found in dry deciduous forest of Gujarat, less frequent in scrub forests,	Swamy, V. N., Gowda, K. N. & Sudhakar, R., 2016
Sapotaceae	*Manilkara hexandra (Roxb.) Dubard*	Rayan	Bark	Red	Tannin	Textile dyeing	wild or self sown near villages, throughout in plains	Upadhyay, R. & Choudhary, M. S., 2014
Sapotaceae	*Mimusops elengi L.*	Borsalli, Bakul	Seed, Leaf	Yellow	Anthraquinone	Cotton and Silk dyeing	Planted in gardens & along roads.	Hossain, S., Jalil, M. A., Kamal, S. A. B., & Kader, A., 2021
Solanaceae	*Capsicum annuum L.*	Marchi	Fruit	Red	Anthraquinone	Edible dye	Cultivated throughout	Arimboor, R. et al., 2015
Solanaceae	*Nicotiana tabacum L.*	Tamaku	Leaf	Green	Quinone	Textile dye	Cultivated as a cash crop.	Soaga, J. A., Agboola, O. J. & Fatoki, J. G., 2014
Solanaceae	*Solanum anguivi Lam.*	Moti-Ringani	Fruit	Black	Flavone	Textile dye	Cultivated throughout	Andriamanantena, M. et al., 2021
Solanaceae	*Solanum nigrum L.*	Piludi, Kangani	Fruit	Brown-Black	Flavone	Textile dye	Gujarat (Throughout, a weed everywhere; common)	Saleem, M. A. et al., 2019
Solanaceae	*Solanum xanthocarpum L.*	Bhoringni	Flower	Light green	Flavone	Dyeing Protein Fabrics	Grown in Saurashtra	Bhandari, B. & Rani, A., 2018

Tamal Patr	*Cinnamomum tamala (Buch.-Ham.) Nees ex Eberm.*	Tamal Patr	Leaf	Brown	Flavone	Textile Dyeing	Cultivated in gardens	Hossain, A., 2020
Tamaricaceae	*Tamarix aphylla (L.) Karst.*	Asare lai	Bark, Flower	Auxillary	Flavone	Textile dyeing	Common throughout rivers & streams, Kachh Region	Baaka, N. et al., 2017
Tiliaceae	*Grewia subinequalis DC.*	Phalsa	Fruit	Yellow-orange	Tannin, Flavone	Food Colourant	Extensively cultivated throughout largely in Gujarat	Khan, R. S. et al., 2019
Ulmaceae	*Trema orientalis (L.) Bl.*	Gol, Vanjli	Bark	Brown	Tannin	Cotton and Silk dyeing	Throughout (except Kachchh) in deciduous forests in Gujarat.	Aggarwal, S., 2021
Verbenaceae	*Duranta repens L.*	Damyanti	Leaf, Seed	Green, Orange	Flavone	Dyeing silk and cotton fabrics	A weed of disturbed sites, waste areas, roadsides, wetter pastures, open woodlands and densely forested areas, and particularly along waterways in sub-tropical and tropical regions.	Thorn, J. P. et al., 2020
Verbenaceae	*Tectona grandis L. f.*	Sag, Sagvan	Leaf	Light green	Anthocyanin, Anthraquinone, Tannin	Edible dye	Throughout in deciduous forest	Arief, I. I., Afiyah, D. N. & Wardhani, D. P., 2014
Vitaceae	*Ampelocissus latifolia (Roxb.) Planch.*	Jungli Draksh	Root	Black	Flavone	Textile Dyeing	throughout on the hedges and forest undergrowths	Anand, D. C., Mishra, P. & Patni, V., 2018
Vitaceae	*Vitis vinifera L.*	Draksh	Leaf	Yellow, green	anthocyanin	Cotton & Wool dyeing	Dangs (Tapi)	Mansour, R., Ezzili, B. & Farouk, M., 2013

Zingiberaceae	*Curcuma aromatica Salib.*	Zedoari	Rhizome	Yellow	Curcuminoid	Food Colourants	Cultivated as well as growing wild in degraded forests and plantations	Anjusha, S. & Gangaprasad, A., 2014
Zingiberaceae	*Curcuma longa L.*	Haldar	Rhizome	Orange	Curcuminoid	Histological Stain, Cosmetic colorant, Food Colorant, Textile dyeing	Cultivated in the gardens.	Suryawanshi, H. et al., 2017
Zingiberaceae	*Zingiber officinale Roscoe.*	Aadu	Rhizome	Pale Yellow	Flavone	Histological Dye	Widely cultivated	Ajileye, A. B. et al., 2015