

(RESEARCH ARTICLE)



Ethnobotanical study of villages from Shahapur taluka of Thane district, (Maharashtra)

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GSC Biological and Pharmaceutical Sciences, 2026, 34(03), 018-029

Publication history: Received on 19 January 2026; revised on 24 February 2026; accepted on 27 February 2026

Article DOI: <https://doi.org/10.30574/gscbps.2026.34.3.0085>

Abstract

The tribal people from Shahapur taluka still depend on folk medicine and household remedies. Data on such knowledge and practice are largely lacking in written communication and require exploration.

Shahapur, the study area, is situated at 19.45° North Latitude and 73.33° East Longitude, in the northern portion of the Konkan region. Shahapur Taluka comprises major tribes, viz., Thakur, Katkari (Kathodi), Warli, Mahadev Koli, and several ethnic groups like Kunbi, Agri, Mahar, and Chambhar, that have been engaged in conservation practices.

The current study is the outcome of a systematic and scientific ethnobotanical investigation undertaken in Shahapur Taluka, Thane District, between June 2018 and February 2020. Observations were made during the current study to identify the Shahapur Taluka's medicinal plants which the tribal people utilize to treat a variety of human and animal ailments. A total of 61 plants belonging to 36 different families of angiosperms are utilized by the tribes or traditional communities for ethnobotanical purposes. Some species of plants are frequently used for both human and veterinary purposes. At least 16 plants (26%) are used exclusively for veterinary ailments and feed for livestock.

Keywords: Ethnobotany; Thane District; Medicinal plants; Northern Konkan; Ailments

1. Introduction

Ethnobotany deals with traditional and natural relationships between human societies and plants [1]. It is acknowledged as an interdisciplinary science encompassing many interesting and useful aspects of plant science, history, anthropology, culture, and literature. Ethnobotany is defined as the "science of people's interaction with plants." Ethnobotanical study in India was promoted by the pioneering work of Dr. S.K. Jain, who is popularly known as the "Father of Indian Ethnobotany."

Ethnobotany is also relevant to the protection of genetic resources. It aids in the discovery of new sources of food, fodder, pharmaceuticals, and other naturally occurring life-supporting organisms. Ethnobotany is essential for both maintaining plant diversity and comprehending and interpreting the knowledge that enables us to manage them successfully and sustainably worldwide. Thus, ethnobotany is a survival science [2].

Though ethnobotany originally addressed interactions between people and plant species diversity, the current scope of this research field addresses aspects of plant diversity conservation and management of biological resources [3].

The tribal people depend on folk medicine and household remedies [4]. The practitioners of traditional medicine, known as Vaidus, typically possess specialized expertise in the treatment of specific ailments, particularly in remote regions

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[5]. The knowledge of such practices among these tribal groups should be assembled and recorded. Data on such knowledge and practice is scarcely documented in documented form, which has to be explored [6].

Ethnobotany is a rapidly expanding science, and ethnomedicine has already piqued the interest of the public. To promote acceptability and awareness among the people, a safer indigenous system should be established for the treatment of various diseases. This will also improve the health and quality of life of the entire nation [7].

Hence, there is a dire need to collect and preserve centuries-old traditions and customs before vital ethnobotanical data is lost.

The current research area, Shahapur, is in the northern section of the Konkan region, at 19.45° North Latitude and 73.33° East Longitude (<https://thane.nic.in>). Shahapur covers an area of 1,616.16 sq km, including 392.91 sq km of reserve forests, 210.18 sq km of protected forests, and 4.05 sq km of acquired forests under the control of the Shahapur Forest Division of Thane Forest Circle in the Thane District of Maharashtra. The tract is hilly and, at times, precipitous. These hills form the outer ranges of the Sahyadri, i.e., the Western Ghats, which run along the eastern boundary of Thane through the Nane Ghat on the border of Pune District [8].

The study area, Shahapur, is hilly, tribally populated, and the largest taluka in Thane district. There are 225 villages and 6 towns in Shahapur taluka. Shahapur taluka has 64,924 houses and a population of 314,103, with 160,466 males and 153,637 females. Children aged 0 to 6 make up 41,172 of the total population, accounting for 13.11%. The sex ratio is about 957, higher than the average for Maharashtra state (929), and the literacy rate in Shahapur Taluka is 65.98%, with 73.23% of males and 58.41% of females being literate (Census of India 2011). The population density is 194 per sq. km. Urban areas account for 77.49% of the overall population, while rural areas make up 22.51%. The population of Scheduled Castes (SC) is 5.74%, and Scheduled Tribes (ST) is 35.72% (as per the Census of India, 2011). The Taluka Shahapur comprises major tribes, viz., Thakur, Katkari (Kathodi), Warli, Mahadev Koli, and several ethnic groups like Kunbi, Agri, Mahar, and Chambhar, that have been engaged in conservation practices. The richness of these locations was one of the motivations behind the current ethnobotanical research. Shahapur taluka is ethnobotanically diverse, both floristically and ethnically. Given this significance, ethnobotanical research was conducted in the taluka to investigate traditional knowledge before it is lost forever.

The scientific objective of the study is to search for the plants used by the tribal people and various ethnic groups. Due to overexploitation and human interference, some of the species may be lost without receiving any attention. Since most of the area is located near tribal settlements, human disturbance in these areas is progressively increasing. One of the important aspects of this study is to compile information about the plants used for different diseases of humans and livestock, and for edible purposes by these tribal and ethnic people.

- Comprehensive survey of the tribal regions within Shahapur Taluka for the purposes of collecting, identifying, and documenting flora utilized for nutritional and medicinal purposes.
- Survey of the tribal regions within Shahapur Taluka to collect, identify, and document plant species utilized as fodder and medicinal resources for livestock.
- Recommendation of plants or plant parts on the basis of experience of tribes.
- Create awareness for the maintenance of ecological balance and conservation of the natural heritage.

2. Material and Methods

2.1. Informants in Ethnobotanical Survey

The ethnobotanical survey methodology was based on established principles in ethnobotany [9]. An Ethnobotanical survey in relation to health and livelihood security was conducted in the Kothare, Musai, Jambha, Nehroli, Kudshet, Lenad B.K., Sakhar Pada, Waryacha Pada, Sarangpuri, Tembhre, Mahuli, Dolkhamb villages of Shahapur Taluka of Thane district (MH). Information was collected from old, experienced persons/village resource persons, Men and women working in the field, Viadus and knowledgeable women; and traditional bone setter (Had vaidu) of the village during the visit.

2.2. Methods of Study

Ethnobotanical studies were conducted in the different villages of Shahapur Taluka of Thane District of Maharashtra. All the villages were regularly visited, and data were collected using a) personal visits, b) interviews, and c) questionnaires.

The documentation of the information given by folk healers and Vaidus was categorized under the following headings:
a) Name of the plant b) Vernacular name c) Family name d) Habit of the plant e) Plant part used f) Name of the disease
g) Other ingredients used h) Drug preparation i) Drug application and its effectiveness.



Figure 1 Map, Thane District

3. Results and discussion

The current study is the outcome of a systematic and scientific ethnobotanical investigation undertaken in Shahapur taluka, Thane District, between June 2018 and February 2020. Observations were made during the current study to identify medicinal plants in Shahapur taluka that the tribal people utilize to treat a variety of human and animal ailments. Information was collected from 48 informants from 12 selected villages. A total of 61 plants belonging to 36 different families of angiosperms are utilized by the tribes or traditional communities for ethnobotanical purposes. Some species of plants are frequently used for both human and veterinary purposes. At least 16 plants (26%) are used exclusively for veterinary ailments and feed for livestock, and this study aims to understand the treatment system of tribes in Shahapur taluka of the Konkan region of Maharashtra. The most used plant parts by local healers are leaves; of 61 plants, the leaves of 35 are used for different purposes. Besides leaves, fruits from about 24 plants are used for medicinal and edible purposes; stems and bark are used from about 21 plants. Shahapur taluka's forests contain several medicinal plants. The collected information has been compared with ethnobotanical literature. Species mentioned in this study show medicinal uses similar to those documented in standard books, journals, and research papers. The tribes of Shahapur taluka use these plants and plant parts to treat the diseases in the form of decoction, paste, gum, juice, crude powder, ash and infusion. They used the plant singly or in combination with other plants. The present study provided information of wild medicinal plants to find out their chemicals and equally helpful to conservation of traditional ethnomedicinal knowledge as well as for progress of tribal's peoples. The details of plant parts used for the specific ailment are mentioned here in Table No. 1:

Table 1 Plant parts and its uses for the specific ailment

Sr. No.	Botanical Name & Family	Local/ Vernacular Name	Plant Part Used	Uses
1	<i>Abrus precatorius</i> L. Fabaceae	Gunj	Leaves, seed	Leaves are chewed to cure cough, 5-7 seeds are fed to cow and buffaloes to expel the placenta.
2	<i>Acacia catechu</i> L. Mimosaceae	Khair	Leaves, Bark, Gum	Leaves are used as fodder. Bark for wound healing of cattle's, Gum is used in diarrhea and in preparation of laddus.
3	<i>Achyranthes aspera</i> L. Amaranthaceae	Aghada	Whole plant, Leaves & root	Whole plant used in preparation of Guli,' (special water is used for preparation "Papad"). Leaves & root paste used as antidote on scorpion sting; roots are used to cause abortion.
4	<i>Annona reticulata</i> L. Annonaceae	Ramphal	Fruits, Leaves	Edible, In case of acidity and stomach disorders leaf extract is used.
5	<i>Annona squamosa</i> L. Annonaceae	Sitaphal	Fruits, Leaves, seed	Fruits are edible. The leaves pest used to control lice.1-2 young leaves kept under teeth in toothache. Seed powder is used as an antimicrobial and insecticidal, and in the treatment of wounds of domestic animals. Dried leaf powder is also used for the same purpose.
6	<i>Argemone mexicana</i> L. Papaveraceae	Kardai, Pivla Dhotra	Seed, Roots	Seeds are used for the oil extraction. Infusion of roots are used in jaundice and Tuberculosis.
7	<i>Azadirachta indica</i> A.Juss. Meliaceae	Kadu neem	Leaves, Twigs, Seed	Leaves are used as insecticidal. To cure skin diseases, skin itching, the leaves are boiled in bath water. As the leaves are insecticidal, they are also used for grain storage. Young twigs are used for cleaning teeth. Oil extracted from the seeds and the cake is used as manure.
8	<i>Bauhinia racemosa</i> Lam Caesalpiniaceae	Aapta, Shid	Leaves, Pods	Young leaves and pod are used as fodder. Young pods are edible. On Vijayadashmi the peoples exchange the leaves with each other as the token of love. Bidis of its leaves filled with <i>Trichospermum ammi</i> are used in congestion in chest, Sore Throat, cold.
9	<i>Bauhinia variegata</i> Caesalpiniaceae	Koral, Kanchan	leaves	leaves are used as vegetable.
10	<i>Bombax ceiba</i> L. Bombacaceae	Sawar	Root	decoction is taken orally in menstrual problems, leucorrhoea. Cotton is obtained from capsules.
11	<i>Butea monosperma</i> (Lam) Taub. Fabaceae	Palas	Leaves, Flowers	leaves are used for making plates, <i>dronas</i> . Flowers are used as natural dye.
12	<i>Calotropis gigantea</i> L. Asclepiadaceae	Rui	Leaves, Latex	Latex is used as an antimicrobial, antibacterial. Generally used to remove the thrones from feet. Lukewarm leaves are used to reduced swelling. In the first three months of pregnancy, a two-inch piece of root mixed with jaggery is ingested as an abortifacient.
13	<i>Capparis zeylanica</i> L. Capparidaceae	Wagoti	Fruits	Fruits are edible. Used as wild vegetable

			Root	Root is antidote in scorpion bite.
14	<i>Carissa carandas</i> L. Apocynaceae	Karvande.	Fruits, Young stem	Fruits are edible. Young shoots are also edible. The inner fleshy part of young stem is edible.
15	<i>Cuscuta reflexa</i> Roxb. Convolvulaceae	Amar vel	Stem	Stem is crushed into water and given as anthelmintic. In jaundice infusion with water is taken once a day for 3 days
16	<i>Cassia fistula</i> L. Caesalpiniaceae	Bahawa	leaves, Pods, Flowers	Pod pulp with water is consumed in Diabetics. Flowers are also used as vegetable in some villages. Leaves are used as fodder.
17	<i>Cassia tora</i> Lam. Caesalpiniaceae	Takla	Leaves	Young tender leaves are cooked as vegetable. Fresh young leaf extract is used as anthelmintic.
18	<i>Celosia argentea</i> L. Amaranthaceae	Kurdu	Leaves	Leaves are an unconventional vegetable and consumed in kidney stone and urinary tract diseases.
19	<i>Cissus quadrangularis</i> L. Vitaceae	Hadjod, Kandvel	Stem	Paste applied to recover the fractured bone in human & animals. For animal's stem is also given orally.
20	<i>Chlorophytum borivilianum</i> <i>Santapau</i> & R.R.Fern. – <i>Asparagaceae</i>	safed musali, Kolu	Leaves, Tubers	Leaves used as vegetable. Tubers are consumed as sex tonic.
21	<i>Cleome viscosa</i> L. Capparidaceae	Piwla Tilwan	Leaf, Pods	The leaf extract is used a very good remedy in earache. The pods are warm in oil and that oil is used in earache.
22	<i>Coccinia grandis</i> L. Cucurbitaceae	Tondali	Fruit	The fruits are a vegetable. Raw fruits are eaten to cure mouth ulcers.
23	<i>Dioscorea bulbifera</i> L. Dioscoreaceae	Kadu-karanda	Bulbs	Bulbs are edible (both the wild and cultivated variety). The tuberous root is boiled and used as food. The bulbs are stored and used as Famine Food.
24	<i>Diospyros melanoxylon</i> Ebenaceae	Tembhurni	Fruit, Leaves	Fruits are edible, Leaves are used for making Bidi.
25	<i>Diospyros nigrescens</i> Ebenaceae	Rakt Roda, Ragat-Rothi	Bark	In sprain bark decoction is taken orally, the warm bark is applied on the swellings. Bark decoction along with turmeric and alum powder is taken for blood purification.
26	<i>Ficus racemosa</i> L. Moraceae	Umber	Fruits, Bark	Fruits are edible. Dried bark powder is applied for wound healing. The root water, which is considered as 'Sheetal' & used as a drink for patients with smallpox, chickenpox, and measles.
27	<i>Garuga pinnata</i> Roxb Buruseraceae	Kakad	Leaves, Bark, Fruits	Leaves used as fodder. Bark powder is used to cure wounds. Fruits are edible
28	<i>Gloriosa superba</i> L. Liliaceae	Agnishikha, Guarichi fule	flowers, Tubers	Flowers are auspicious used in Gauri Ganpati festival, for Gauri puja. Roots are highly poisonous;

				consumption causes death in humans. Root tubers are given internally to animals to kill maggots from wounds. Root powder is also applied externally, cures wound rapidly.
29	<i>Grewia tiliifolia</i> Vahl Tiliaceae	Dhaman	Leaves, Fruits	Fruits are edible. Leaves are used as fodder.
30	<i>Helicteres isora</i> Sterculiaceae	Murud sheng	Pods	Pods paste is very good remedy in stomach-ache and dysentery.
31	<i>Hibiscus cannabinus</i> L. Malvaceae	Ambadi	Leaves, Seeds	Leaves are used as vegetable. Its fibres are used for making ropes.
32	<i>Hibiscus rosa-sinensis</i> L. Malvaceae	Jaswand	Leaves, Root	Leaves warmed and applied over boils. Root paste along with sugar is given to cure dysentery.
33	<i>Holarrhena antidysenterica</i> L. Apocynaceae	Kuda	Leaves, Bark, Latex	The latex from leaves are applied over the skin infection (ringworm). The bark decoction is given as antidysentery drug. Leaves are used for making the leaf plates, to wrap the flowers.
34	<i>Hygrophila schulli</i> (Buch. Ham.) Acanthaceae	Likhara; Talimkhana	Seeds Root	Seeds are used for making laddu with gud. Root extract with sugar or honey is used for haemorrhage and gonorrhoea. Root extract is also given to males to boost sex drive and increase sperm count.
35	<i>Jatropha curcas</i> L. Euphorbiaceae	Chandarjyot, Mogali erand	Bark	Inner bark and turmeric are warmed for a few minutes and then applied over swellings. Over consumption of cotyledons causes nausea, headaches, or unconsciousness.
36	<i>Lagerstroemia lanceolata</i> Wall Lythraceae	Bondara, Nana bonda	Leaves	Leaves used in making vegetable of <i>Amorphophallus commutatus</i> inflorescence and leaves, which reduces their irritation.
37	<i>Leea macrophylla</i> Roxb Vitaceae	Dinda	Leaves, Roots	Leaves are used to serve food. Roots are applied over inflammations.
38	<i>Luffa cylindrica</i> L. Cucurbitaceae	Ghosali	Fruits	Fruits used as vegetable. Juice of young fruit is given to cure cough.
39	<i>Madhuca longifolia</i> Sapotaceae	Mahua, Moha	Leaves, fruits, flowers, Seeds, Oil Cake	The young or dried flowers approx. 1-2 kg are given to cows and buffaloes to easy expel of placenta. The flowers are also used for making country liquor. The Young ripe fruit (fresh or dried) are consumed as vegetable. Seeds are used for making edible oil. Most of the tribal peoples are completely dependent on this oil. The raw oil is applied for massage during body pain; it is also applied externally to reduce fever. The cake obtained after extraction of oil is used as fish poison. The oil cake is burnt in homes to avoid entry of snakes in houses.
40	<i>Mangifera indica</i> L. Anacardiaceae	Mango	Bark, Fruits	Fruits are edible. Bark decoction is given orally to cure the diarrhoea in cattle. Bark powder is applied for wound healing. Latex from the bark is applied in sticks to trap birds.
41	<i>Meyna spinosa</i> L. Rubiaceae	Aliv	Fruits	Fruits are edible. Sold in local market.

42	<i>Mimosa pudica</i> L. Mimosaceae	Lajalu	Leaves, Roots	Leaves decoction is given in urinary tract infection. Root powder is given along with sugar candy twice a day for 7 days to reduce the excessive bleeding in menopause.
43	<i>Momordica dioica</i> Roxb Cucurbitaceae	Kartoli, kantoli	Fruits, Roots	Fruits used as vegetable. Root paste is applied on the poisonous bite.
44	<i>Moringa oleifera</i> Lam Moringaceae	Shevga	Leaves, Flowers, Fruits	Young Leaves are consumed as vegetable. Flowers are edible. Pods are also used as vegetable. It is used in making the Sambaar. Young leaves fresh extract is used in eye irritation.
45	<i>Mucuna pruriens</i> L Fabaceae	Kapikacchu, Khajkuyali	Leaves, Pods	Young leaves are used as fodder for young calves. The seeds consumed as sex tonic, to increase sperm count.
46	<i>Nelumbo nucifera</i> Nymphaeaceae	Kamal	Rhizome, Flowers	To avoid habitual abortions, rhizomes of the plant crushed and boiled with milk is recommended. flowers are boiled in water and internally used for abnormalities of the umbilical cord.
47	<i>Pongamia pinnata</i> L. Fabaceae	Karanj	Leaves, Seeds	Leaves are used as fodder. Seed oil is applied on wound of animals to remove maggots.
48	<i>Psidium guajava</i> L. Myrtaceae	Peru	Leaves, Fruits	Fruits are edible. Leaves are astringent. Leaves chewed to reduce toothache. Young leaves extract is also given for overdose of alcohol, which dramatically reduces the impact of alcohol within few minutes. Young leaves are also chewed to increase the appetite.
49	<i>Pterocarpus marsupium</i> L. Fabaceae	Bibala	Bark, Wood	In diabetics wood piece is soaked in one cup of water overnight and this water is taken in early morning. Bark powder is used in preparation of manjan, to cure toothache.
50	<i>Sapindus laurifolius</i> Vahl Sapindaceae	Ritha	Fruits, Bark	Stem bark is utilized as a fish poison. Fruits are used as a detergent for cleaning jewelry, clothing, and hair. .
51	<i>Semecarpus anacardium</i> Anacardiaceae	Bibba, Bibbva	Mature receptacles seed oil	Ripe matured receptacles are edible. Oil extracted from pericarp is effective antiseptic applied on cuts or wound caused after removing the thorns from feet.
52	<i>Sida acuta</i> Burm Malvaceae	Chikani	Leaves	Leaf extract is taken externally as a sex tonic.
53	<i>Sterculia urens</i> Roxb. Sterculiaceae	Kandhol	Gum	Gum is used to cure diarrhoea. In skin diseases affected part is rubbed on bark of the tree.
54	<i>Syzigium cumuni</i> L. Myrtaceae	Jambhul	Leaves	The leaves are burnt as insecticide. The fruits are edible. Seed powder is consumed to control the blood sugar level. Fruits are used in liquor production.
55	<i>Terminalia alata</i> (Heyne ex Roth) Combretaceae	Ain	Bark, wood, Gum	Bark powder is applied externally for the wound healing purpose, in human as well as animals. Bark decoction is taken as heart tonic. Twigs are used for fencing. Timber & fuel Wood is obtained from it. Gum is edible.

56	<i>Terminalia arjuna</i> (Roxb.) Combretaceae	Arjun	Bark, Wood, Gum	For red/white vaginal discharge, bark decoction is taken orally. Decoction of bark powder is used to treat deep wounds of cattle. Leaves are used as Fodder.
57	<i>Terminalia bellirica</i> Combretaceae	Behda, vehala	seeds, wood	The pericarp chewed in constipation. The cotyledons are edible, Children eat it but over consumption causes nausea, hallucination wood is used as timber.
58	<i>Tinospora cordifolia</i> (Willd.) Menispermaceae	Gulvel	Stem	The extract of Fresh or dried stem is used in Fever and to control blood sugar level.
59	<i>Urena lobata</i> Malvaceae	Vanbhendi	Stem, Root	Root paste is applied on joints in rheumatic pain. Stem are used to obtained fibre.
60	<i>Vitex negundo</i> Verbenaceae	Vanai, Nirgundi	Leaves	Leaves are boiled with water and used to reduce body pain. Crushed young leaves are also applied on swollen part to reduce swelling and pain. Leaves externally kept on lower abdomen to reduce problems of urinary tract.
61	<i>Ziziphus rugosa</i> L. Rhamnaceae	Toran	Leaves, fruits, and seeds	Fruits are edible, sold as “Ranmeva”. Seeds are also consumed after fried. Leaves are used as fodder for goats.

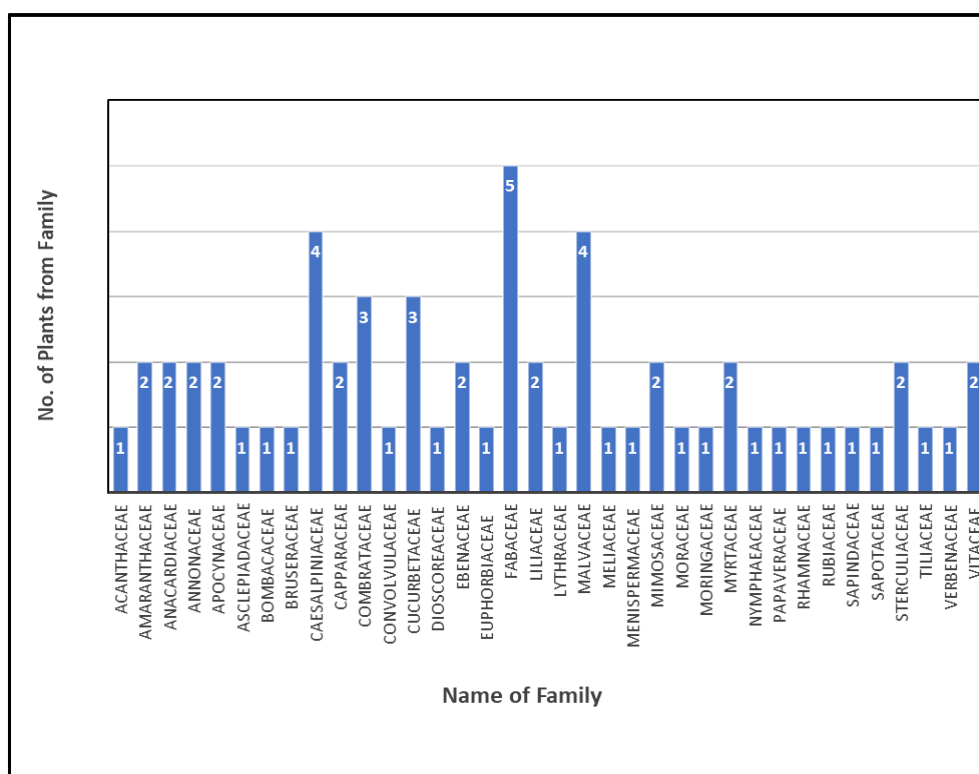


Figure 2 Plants used in treatments and its family

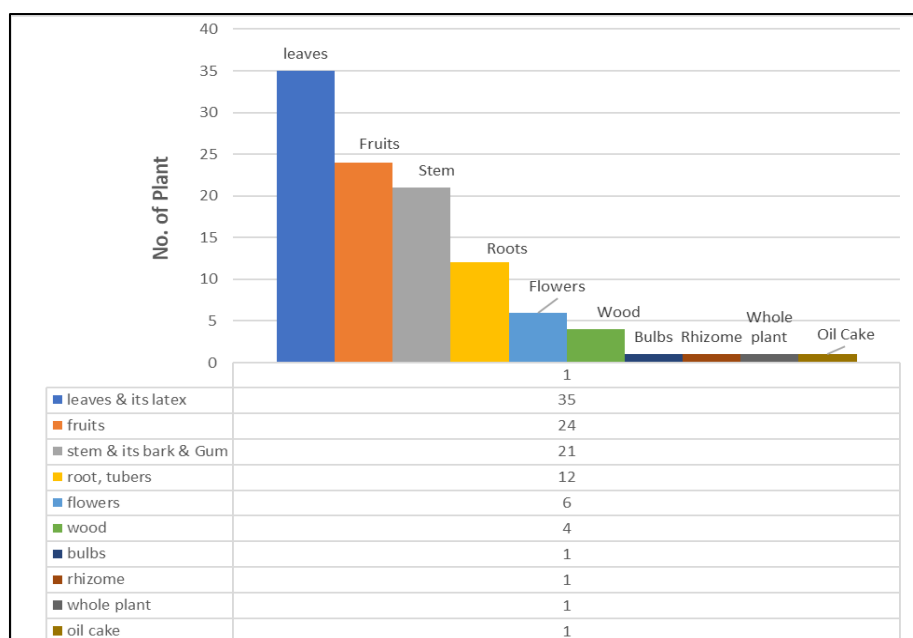


Figure 3 Plant parts used for edible and medicinal purpose

4. Conclusion

In the last few years traditional knowledge on medicinal plants has gained importance all over the world. Ethnobotanical research can help preserve knowledge and discover novel bioactive components in plants. This study aims to investigate medicinal plants used by tribals in Shahapur taluka.

The present research concludes that even though allopathic medicine is used to cure various diseases and disorders in humans, domesticated animals, and plants. The tribes of the Shahapur region fully depend on wild plants for the cure of their diseases and disorders. Presently, due to allopathic treatment and lack of interest of younger generation in traditional practice there is possibility of losing traditional knowledge in future. Therefore, it has become necessary to make documentation and preserve traditional knowledge.

The present study elaborated on the knowledge of the unconventional food used by tribals, which may become helpful to eradicate the burning issue of malnourishment in the present study area. This study also helped to document the tribes' vast indigenous knowledge of medicinal plants and plant-based healing methods. For example, *Madhuca indica* L. is the plant that is used for different purposes. All parts of this plant are useful. Basically, the oil is very useful as an edible oil, and it is also used medicinally. Thus, the present study opens up the valuable knowledge of plants having with the tribal peoples about the uses of plant as food and medicine.

Plants like *Psidium guajava* L. have anti-alcoholic properties; further study may be helpful for formulating anti-alcoholic drugs.

This study shows that there is great diversity in the medicinal and edible plants in the selected area. This study can help prioritize conservation efforts by identifying areas with high concentrations of these species.

Most of the tribes of Shahpur taluka, such as Thakur, Mahadeo Koli, and Katkari/Kathodi, dwell on the hilly slopes of Sahyadri. Cultural, social, and economic activities can both positively and negatively affect forest vegetation. They have a unique perspective on forests because they have spent their entire lives surrounded by nature. They value and appreciate the natural environment that sustains them. Their mythologies, taboos, customs, and rituals differ. They have created their own ancestral methods for utilizing natural resources.

Forest fire is one of the most serious hazards in the Shahapur forest region. Many trees such as *Syzigium cumini*, *Terminalia alata*, *Mangifera indica*, *Pongamia pinnata*, *Terminalia bellirica*, *Acacia catechu*, *Anogeissus latifolia*, *Lagerstroemia parviflora*, *Tectona grandis*, *Pterocarpus marsupium*, and *Sterculia urens* fall victim. The absence of a top canopy or higher story renders these areas desolate.

'Rabani' is one of the agricultural practices, in which biomass leaf litter and dried grass are burned, which causes a negative influence on flora. Indigenous people remove entire branches and twigs from large trees, curtail them widely, and collect plant litter from the woodland. This biomass is burned in the paddy fields and 'varkas' (i.e., open) areas. Plants such as *Terminalia alata*, *Terminalia bellerica*, *Calycopteris floribunda*, *Butea monosperma*, and *Holarrhena antidysentrica* are severely lopped. Though biomass and humus are good sources of soil nutrients, unfortunately, this practice is harming the natural process of recycling the nutrients. Nowadays, due to land ownership, indigenous peoples have restricted their actions. Presently, they are using modern technology and techniques in addition to traditional agricultural practices.

Indigenous peoples continue to rely solely on the forest to meet their daily fuel needs. Collecting fuel wood takes a significant amount of time and energy. They primarily cut plants such as *Vitex negundo*, *Bridelia retusa*, *Butea monosperma*, *Butea superba*, *Carissa congesta*, *Bauhinia recemosa*, *Madhuca indica*, *Diospyros melanoxylon*, *Terminalia alata*, *Tectona grandis* etc.

There is a need to make them aware of the use of biogas as fuel for household purposes. Government should have to provide subsidise for construction of biogas plants, and also the proper subsidise on LPG for tribals are needed.

NGOs and different governmental bodies need to pay attention to the tribals, and there is a need to create sensitization among tribals regarding biodiversity conservation, as tribals are very directly connected with maintaining proper ecological balance.

Compliance with ethical standards

Acknowledgments

The authors gratefully acknowledge all the Informants and the Department of Botany, The Institute of Science, Dr. Homi Bhabha State University, Mumbai, for providing the necessary laboratory facilities and infrastructural support to carry out this research.

Disclosure of conflict of interest

All authors declare that they have no conflict of interest or competing interests related to this manuscript

Statement of informed consent

Informed consent was obtained from all participants included in the study.

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