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NTFPs AND THEIR CONTRIBUTION TO LIVELIHOOD SECURITY AND INCOME INEQUALITY MITIGATION AMONG LANDLESS RURAL AND TRIBALS OF JHARKHAND

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ABSTRACT

Tribes holistically depend on forests and forests products as they have symbiotic relationship with the forest's ecosystem. NTFP-based bioeconomy has given a new dimension to the forest sector. Non-Timber Forest Products (NTFPs) constitute approximately 40% of total forest revenues and 55% of forest-based employment in India, playing a crucial role in sustaining livelihoods and mitigating income inequality among ethnic groups. In India, Jharkhand is so rich in diverse resources specially in green resources. Despite Jharkhand's abundant agricultural resources, rural communities are actively seeking alternative livelihood options. Smallholder agriculture faces challenges from increasing occurrences of unseasonal and extreme weather events, heightening risks and threatening livelihood security. NTFPs serve as a supplementary income source for rural and ethnic population. This study is based on ethnobotanical survey of NTFPs, analyzing medico-cultural values of different species of NTFP sector across four districts Ranchi, Khunti, Deoghar and Sahibganj in Jharkhand using \ fieldwork research method. The research underscores the active involvement of tribal women in various aspects of NTFP activities and highlights the need for increased awareness and interventions among rural communities. NTFPs encompass all biological materials aside from timber extracted from forests for human use, supporting cultural subsistence, commercial ventures, bioprospecting, and sustainable forest biodiversity. This research,

conducted in a protected area, documents the significance of plant-based NTFPs, aiming to guide future investigations, explore medicinal uses, and promote sustainable forest management to benefit local communities.

KEYWORDS: NTFP, Availability, Productivity, Livelihood, Jharkhand.

1. INTRODUCTION

Non-timber forest products (NTFPs) are biologically derived goods other than timber, sourced from natural, modified, or managed forest landscapes. These include fruits and nuts, vegetables, medicinal plants, gums and resins, essences, bamboo, rattans, and palms; as well as fibers and flosses, grasses, leaves, seeds, mushrooms, honey, and lac, among others. NTFPs encompass all resources or products that can be harvested from forest ecosystems and are used within households, marketed, or hold social, cultural, or religious significance.[1] These products play vital roles in the livelihoods of millions of rural and ethnic people worldwide.[2,3,4] The majority of rural households in developing countries, along with a significant portion of urban households, rely on these products to meet various nutritional, health, housing, and other needs.[5] The contribution of these resources to livelihoods typically accounts for 10-60% of total household income.[6,7] NTFPs also offer many households a means of income generation, either as supplementary income to other livelihood activities or as the primary source of cash.[7,8,9,10,11] Additionally, NTFPs create high economic value and provide large-scale employment.

NTFPs have garnered global interest due to the growing recognition of their role in enhancing rural livelihoods.[12,13] Over a billion people worldwide rely directly on forests for their livelihoods, while the rest of us benefit from forests' economic, social, and environmental contributions, such as rainfall regulation, biodiversity, pollinators, carbon storage, and clean water. NTFPs play a significant role in providing food, fuel, feed, health, and fiber for growing populations. Their importance in rural livelihoods, particularly in developing countries, is well recognized. In India, NTFPs generate an income equivalent to USD 2.7 billion annually and account for 55% of total forestry sector employment. Additionally, 50% of forest revenues and 70% of forest-based export income come from these resources.[14,15] NTFPs provide 50% of household income for approximately one-third of India's rural population. Given the critical importance of NTFPs in the livelihoods and well-being of local people, particularly in the developing world, it is perplexing why the sector receives so little attention in development policies, budgets, and programs from relevant government

departments, such as forestry, agriculture, rural development, environment, and energy. In Jharkhand, a forested state, the lives and livelihoods of a majority of people around forests depend heavily on forestry activities. Forest-based livelihoods primarily involve the collection, processing, and selling of various NTFPs throughout the year, complemented by some seasonal subsistence agriculture in the forest fringe areas.

The tribal communities and forest dwellers of Jharkhand have harmoniously coexisted with forest resources for generations. Every aspect of their life and livelihood is intertwined with NTFPs, whether it is the food they eat in the form of leaves (Katai sag, Putkal, Banskarerl), fruits (Mahua fruit, Kend fruit, etc.), fibers, and tubers, or the seeds they use for animal fodder, the houses they live in, the medicines they use, or the cloth and ornaments they wear. In many forested areas of Jharkhand, these forest products support the tribal communities for 6-8 months a year, providing both subsistence and cash income. However, a comprehensive ethnobotanical study on the status of NTFPs is lacking. With significant knowledge gaps exist regarding various varieties and the yield potential of NTFPs in different methods.

2. METHODOLOGY

This section provides description of study area, about fieldwork and the process of collection of NTFPs employed to investigate the ethnobotanical features of NTFPs species, analyzing the ethnic activities within the NTFP sector across four districts Ranchi, Khunti, Deoghar and Sahibganj in Jharkhand.

2.1 Study Area

The state of Jharkhand ($22^0$28'- $25^0$30' N latitude and $83^0$22'- $87^0$4' E longitude) with a geographical area of 79,714 km^2 and average elevation of 6- 1366 m (from the mean sea level) lies in central-north-eastern region of India (Fig. 1). The population of Jharkhand is about 3.3 million, includes 32,620 villages and is home of various ethnic tribes namely Santhal, Munda, Oraon, Ho, Bhumis etc. Jharkhand largely comprises forest tracts of Chotanagpur plateau and Santhal Pargana. The whole state is mountainous regions covered with dense growth of forest. About 29% land is covered by forest areas containing vast resource and minerals. The Forest cover in the state, based on interpretation of satellite data in FSI report, is 23,721 km^2 which is 29.76 % with increase in 110 km^2 of the state's geographical area. In terms of forest canopy density classes, the state has 2,590 km2 areas under very dense forest, 2,601 km^2 areas under moderately dense 9689 km forest and dense forest and 11,431 km^2 areas under open forest. The assessment was carried out across as

many as 8 sites purposively selected out of 14 forest divisions within different agro climatic zone and forest types of state (Fig.1).

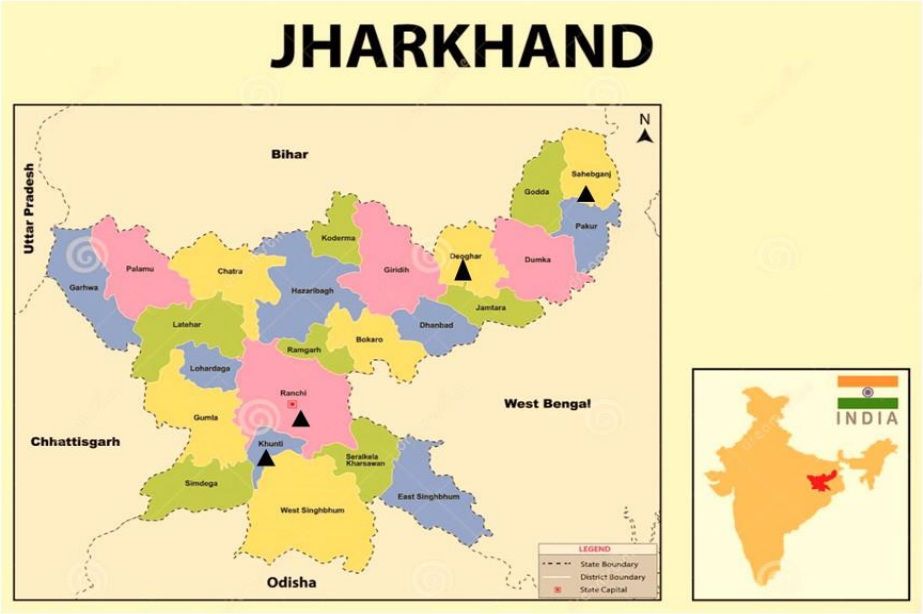

Fig. 1: Map showing selected Study Area of Jharkhand.

2.2 Data Collection

Data Collection was done through questionnaires among collectors/ harvesters & traders involved in NTFPs business/trade. This fieldwork was done during the 2020-2021 period. Data were collected from Forest Department, and local mandies of different districts like Ranchi, Khunti, Deoghar and Sahibganj. (Fig. 2)

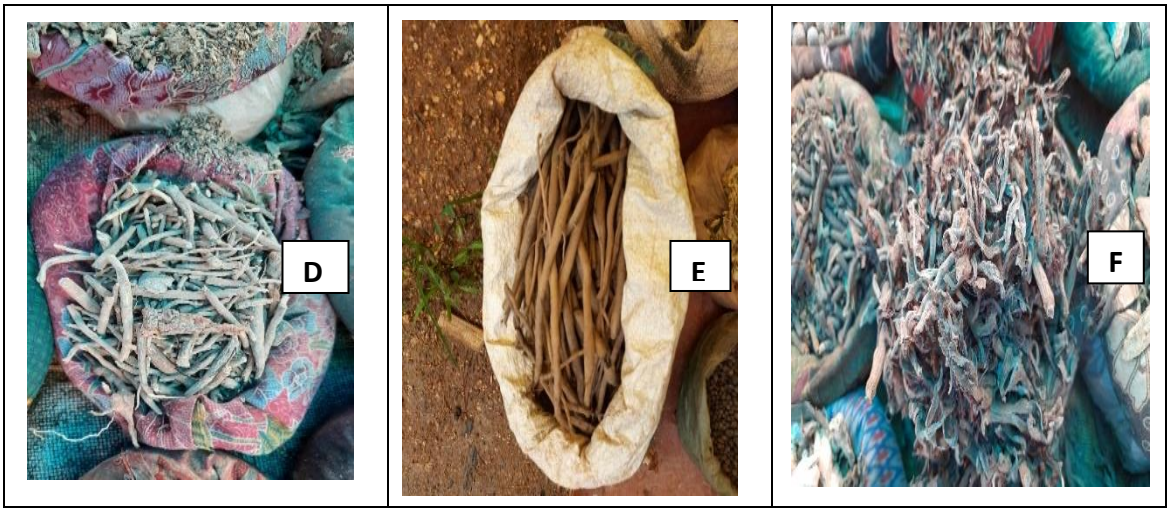

Fig. 2: A to F showing collection of NTFPs from different Villages in Jharkhand.

3. RESULTS

The study documented a total of 100 plant species belonging to various genera and families that are traditionally utilized by the indigenous communities residing in the fringe villages of Jharkhand (Table 1). Among the 32 recorded families, Fabaceae was the most dominant, represented by 20 species **(Fig. 3)**. This was followed by five families Acanthaceae, Lamiaceae, Phyllanthaceae, Malvaceae and Apocynaceae. Additionally, five families Phyllanthaceae, Asteraceae, Lamiaceae, Lauraceae, and Myrtaceae had 3 species each. Plants parts were used to treat different diseases are constituted the highest proportion, Leaves (40%), followed by whole plants (30%), Fruit (10%), Seeds (4%), Tuber (4%) and Stem (2%) **(Fig. 4)**. Out of the 100 documented Non-Timber Forest Products (NTFPs), 75 species were identified as edible, 25 species possessed ethnomedicinal significance particularly in the treatment of cardiovascular conditions, arthritis, bronchial disorders. Table 1 presents these plant species with their validated scientific names as per the International Plant Name Index (IPNI), along with information on their botanical families, local names, habit, specific uses, parts used, and calculated use values. Analysis of plant usage across four selected villages revealed that a total of 100 species were utilized by local communities: 75 species were recorded from Deoghar, Khunti, and Ranchi, while 25 species were reported from Sahibganj **(Table 1)**.

Table 1: List of NTFPs used by the people residing in fringe villages of different districts of Jharkhand. Abbreviations used: a - Bark, Fl - Flowers, Fr - Fruits, I - Inflorescence, L - Leaves, P - Petiole, R - Roots, Re - Resin, Rh - Rhizome, Se - Seeds, St - Stem, Tu - Tuber, Tw - Twigs, WP - Whole Plant; S - Shrub, T - Tree, C - Climber, H - Herb).

S.No	Species	Family	Vernacular name	Habit (Parts used)	Use and application
1.	*Andrographis paniculata*	Acanthaceae	Kalmegh	S (Fl, Tw)	Fever, loss of tuberculosis, mouth ulcers, bronchitis gastro-intestinal disorder etc.
2.	*Bryophyllum Pinnatum*	Crassulaceae	Patharchur	S (Fl)	Dissolving kidney stones, and insect bites.
3.	*Datura stramonium*	Solanaceae	kala dhatura	C (Tw)	Arthritis
4.	*Centella asiatica*	Apiceae	Brahmi	T (St)	Leprosy, lupus, varicose ulcers, eczema, relieving anxiety.
5.	*Cassia fistula*	Fabaceae	Amaltas	T (St,Ba)	Treatment of inflammatory swellings and as a cleaning agent for ulcers and wounds
6.	*Tinospora cordifolia*	Menispermaceae	Giloy	C (L)	Purified blood and fights bacteria it can reduce fevers like dengue, and malaria etc.
7.	*Phyllanthus acidus*	Phyllanthaceae	Star Gooseberry	H (Fr)	inflammatory, rheumatism, bronchitis, asthma, respiratory disorder, hepatic diseases and diabetes in India
8.	*Emblica officinalis*	Phyllanthaceae	Amla	T (Tw, L,Ba)	Diuretic
9.	*Caesalpinia bonducella*	Fabaceae	katkaraija	H (L,I)	Fever
10.	*Zizyphus xylopyrus*	Rhamnaceae	Kankar	C (L)	Ground and applied as poultice for cure of swelling.
11.	*Terminalia arjuna*	Combretaceae	Arjun	S (WP)	Heart disease
12.	*Mucuna prurita*	Fabaceae	Alkusi	T (Fr, L)	Cholera
13.	*Terminalia bellirica*	Combretaceae	Bahera	C (Tu)	piles, dropsy, diarrhea, leprosy
14.	*Syzygium cumini*	Myrtaceae	Jamun	C (Tu)	Diabetes
15.	*Clitoria*	Fabaceae	Aparajita	S (WP)	Anti-diuretic

	ternatea				
16.	*Aegle marmelos*	Rutaceae	Bel	T (Fr, L)	Diarrhea, diabetes, gastro-intestinal disorder etc.
17.	*Juglans regia*	Juglandaceae	Bhelwa	T (S)	cut and wounds
18.	*Moringa oleifera*	Moringaceae	Munga	T (WP)	Arthritis, asthma, cancer, constipation, diabetes, pain, heart disease, high blood pressure.
19.	*Ocimum sanctum*	Lamiaceae	Tulsi	S (L,S)	Cough, Cold, Bronchitis, Expectorant
20.	*Clitoria ternatea*	Fabaceae	Aparajita	S (F, L)	Anti diuretic
21.	*Anethum graveolens*	Apiaceae	Sowa	H (L,S)	Chronic disease, abdominal pains, eye diseases and uterine pains.
22.	*Justicia adhatoda*	Acanthaceae	Basak	S (W,P)	Bronchitis, cough.
23.	*Datura stramonium*	Solanaceae	kala dhatura	S (L,S)	Arthritis
24.	*Plumeria alba*	Apocynaceae	Gulaichi	T (B,L)	wound,fever
25.	*Mucuna prurita*	Fabaceae	Alkusi	S (R,F)	Cholera
26.	*Rauvolfia serpentina*	Apocynaceae	Sarpagandha	S (L,F)	antidote for bites of snakes, insects, etc
27.	*Solanum xanthocarpum*	Solanaceae	Rengni	S (L,F)	Applied locally for pains and juice with pepper taken in rheumatism
28.	*Annona reticulata*	Annonaceae	Sita fal	T (L,F)	Antidiabetic, antitumor, anti-malarial, anthelmintic.
29.	*Syzygium cumini*	Myrtaceae	Jamun	T (S)	Diabetes
30.	*Azadirachta indica*	Meliaceae	Neem	T (WP)	diabetes, Antiseptic, piles, leprosy etc
31.	*Andrographis paniculata*	Acanthaceaee	chiraita	S (WP)	Maleria, Chronic Fever.
32.	*Althaea officinalis*	Malvaceae	Marsh Mallow	S (L)	Skin disease furunculosis, eczema, and dermatitis.
33.	*Andrachne aspera*	Leguminosae	apamarga	S (L,R)	Cough bronchitis.
34.	*Piper betle*	Piperaceae	Vetrilai	S (L)	Bronchitis, Cough.
35.	*Angelica glauca*	Apiaceae	choru	S (W, P)	dyspepsia, constipations, dysentery
36.	*Juglans regia*	Juglandaceae	Bhelwa	H (L,S)	cut and wounds
37.	*Cassia fistula*	Fabaceae	Amaltas	T (L, S)	Cathartic also applied in rheumatism
38.	*Plumbago indica*	plumbaginaceae	Rakta Chitrak	S (S,R)	Indyspeipsia, Colic, Inflammation,Cough.
39.	*Boerhavia diffusa*	Fabaceae	koenar	T (L, S)	Jaundice, Cardiac Disorder.

40.	*Cinnamomum zeylanicum*	Lauraceae	Dalchini	H (B)	Bronchitis, Asthma, Cardiac Disorder.
41.	*Argemone mexicana*	Papaveraceae	Mexican poppy	S (WP)	Inflammations, Colic, Malarial Fever Wounds, Ulcers. Asthma, Constipation,
42.	*Saraca asoca*	fabaceae	Ashok	T (B,F)	Uterine, Disorder, Deiabetes.
43.	*Asparagus racemosus*	Liliaceae	Satavari	H (L,Tub)	Bronchitis, General Weakness, Fatigue, And Cough.
44.	*Solanum nigrum*	Solanaceae	Makoi/Kakamachi	H (WP)	Dropsy, General Debility, Diuretic, Anti Dysenteric.
45.	*Acalypha indica*	Euphorbiaceae	Khokali	H (WP)	Anthelmintic, Expectorant, Emetic, Hypnotic, Asthma, Pneumonia
46.	*Annona squamosa*	Annonaceae	Sita fal	T (L,F)	antibacterial, antidiabetic, antitumor, anti-malarial, anthelmintic.
47.	*Ribes himalense*	Grossulariaceae	pani amla	H (L,F)	Fever
48.	*Calotropis gigantea*	Apocynaceae	akvan	S (B,L)	Diabetes
49.	*Artemisia vulgaris*	Asteraceae	tite pati	S (L,R)	blood pressure
50.	*Curcuma longa*	Zingiberaceae	kacchi haldi	H (Tub)	wound,fever
51.	*Holarrhena antidysenterica*	Apocynaceae	Kutaj	S(Fl,Tw)	Used for treating dysentery, diarrhea, and intestinal infections.
52.	*Adhatoda vasica*	Acanthaceae	Vasaka	S (Fl)	Used to treat respiratory disorders like asthma, bronchitis, and cough.
53.	*Justicia adhatoda*	Acanthaceae	Malabar Nut	C (Tw)	Synonym of Adhatoda vasica, used similarly for respiratory issues.
54.	*Albizia lebbeck*	Fabaceae (Mimosoideae)	Siris	T (St)	Used for asthma, allergies, skin diseases, and inflammation.
55.	*Delonix regia*	Fabaceae (Caesalpinioideae)	Gulmohar	T (St,Ba)	Used in traditional medicine for rheumatism and inflammation.
56.	*Pongamia pinnata*	Fabaceae (Papilionoideae)	Karanja	C (L)	Used for skin diseases, wounds, and as an anti-inflammatory agent.
57.	*Jatropha curcas*	Euphorbiaceae	Ratanjot	S (Fr)	Used as a purgative; seeds and latex are used for skin ailments.
58.	*Argemone*	Papaveraceae	Mexican Poppy	T (Tw,	Used for skin diseases,

	mexicana			L,Ba)	wound healing, and antimicrobial properties.
59.	*Cajanus cajan*	Fabaceae (Papilionoideae)	Pigeon Pea	H (L,I)	Used to treat wounds, ulcers, and as a diuretic.
60.	*Glycyrrhiza glabra*	Fabaceae (Papilionoideae)	Licorice	C (L)	Used for cough, sore throat, and as an anti-inflammatory agent.
61.	*Coriandrum sativum*	Apiaceae	Coriander	S (WP)	Used for digestive problems, as a carminative and antispasmodic.
62.	*Foeniculum vulgare*	Apiaceae	Fennel	T (Fr, L)	Used to relieve bloating, gas, and indigestion.
63.	*Nigella sativa*	Ranunculaceae	Kalonji	C (Tu)	Used for boosting immunity, treating asthma, and inflammation.
64.	*Solanum nigrum*	Solanaceae	Makoy	C (Tu)	Used for liver disorders, ulcers, and as a diuretic.
65.	*Mucuna pruriens*	Fabaceae (Papilionoideae)	Kaunch	S (WP)	Used as a nerve tonic and in the treatment of Parkinson's disease.
66.	*Croton tiglium*	Euphorbiaceae	Jamalgota	S (Fr, L)	Used as a powerful purgative; toxic if not properly used.
67.	*Argyreia nervosa*	Convolvulaceae	Elephant Creeper	C (S)	Used for nervous disorders and as an aphrodisiac.
68.	*Cuscuta reflexa*	Convolvulaceae	Amarbel	C (WP)	Used to treat liver disorders and as a hair tonic.
69.	*Calotropis procera*	Apocynaceae	Aak	S (L,S)	Used for treating skin diseases, pain, and inflammation.
70.	*Ailanthus excelsa*	Simaroubaceae	Tree of Heaven	S (F, L)	Used for asthma, dysentery, and as an astringent
71.	*Bauhinia variegata*	Fabaceae (Caesalpinioideae)	Kachnar	H (L, S)	Used for ulcers, goiter, and skin diseases.
72.	*Euphorbia tirucalli*	Euphorbiaceae	Pencil Tree	S (WP)	Used traditionally for asthma, earache, and as a purgative.
73.	*Datura metal*	Solanaceae	Datura	S (L,S)	Used for asthma and pain relief; toxic in large doses.
74.	*Ricinus communis*	Euphorbiaceae	Castor	T (B, L)	Used as a laxative and for joint pains.
75.	*Tylophora indica*	Apocynaceae	Antamul	S (R,F)	Used for asthma, allergies, and rheumatism.
76.	*Aerva lanata*	Amaranthaceae	Mountain Knotgrass	S (L,F)	Used for urinary tract infections and kidney stones.

77.	*Tephrosia purpurea*	Fabaceae (Papilionoideae)	Wild Indigo	S (L,F)	Used for liver disorders and as a blood purifier.
78.	*Leucas aspera*	Lamiaceae	Dronapushpi	T (L,F)	Used for cold, cough, and insect bites.
79.	*Ipomoea carnea*	Convolvulaceae	Bush Morning Glory	T (S)	Used for its sedative and anti-inflammatory properties.
80.	*Argemone mexicana*	Papaveraceae	Pila dhatura	T (WP)	Repeated: used for skin ailments and antimicrobial purposes.
81.	*Carthamus tinctorius*	Asteraceae	Safflower	S (WP)	Used for cardiac diseases and menstrual problems.
82.	*Amaranthus spinosus*	Amaranthaceae	Spiny Amaranth	S (L)	Used for treating inflammation and gastrointestinal disorders.
83.	*Achyranthes aspera*	Amaranthaceae	Chirchira	S (L,R)	Used for asthma, cough, and as a diuretic.
84.	*Boerhavia diffusa*	Nyctaginaceae	Punarnava	S (L)	Used for kidney disorders and as a diuretic.
85.	*Tribulus terrestris*	Zygophyllaceae	Gokhru	S (WP)	Used for urinary disorders and as an aphrodisiac.
86.	*Eclipta prostrata*	Asteraceae	Bhringraj	H (L,S)	Used for liver disorders and as a hair tonic.
87.	*Phyllanthus amarus*	Phyllanthaceae	Bhui Amla	T (L, S)	Used for liver disorders and as a hair tonic.
88.	*Cleome viscosa*	Cleomaceae	Wild Mustard	S (S, R)	Used for respiratory and digestive disorders.
89.	*Sesbania grandiflora*	Fabaceae (Papilionoideae)	Agathi	T (L, S)	Used for respiratory and digestive disorders.
90.	*Lawsonia inermis*	Lythraceae	Henna	H (B)	Used for liver problems and as an anti-inflammatory.
91.	*Indigofera tinctoria*	Fabaceae (Papilionoideae)	Indigo	S (WP)	Used for wound healing and as an anticoagulant.
92.	*Tridax procumbens*	Asteraceae	Coat Button	T (B, F)	Used for respiratory and urinary disorders.
93.	*Solanum xanthocarpum*	Solanaceae	Kantkari	H (L,Tub)	Used for skin diseases and constipation.
94.	*Cassia tora*	Fabaceae (Caesalpinioideae)	Chakramard	H (WP)	Used for respiratory and gastrointestinal issues.
95.	*Ocimum gratissimum*	Lamiaceae	Ram Tulsi	H (WP)	Used as a spice and for treating colds, diabetes.
96.	*Cinnamomum tamala*	Lauraceae	Tejpat	T (L,F)	Used for digestive disorders and mental health.
97.	*Acorus calamus*	Acoraceae	Sweet Flag	H (L,F)	Used for dental pain, antiseptic and digestive stimulant.
98.	*Eugenia*	Myrtaceae	Clove	S (B, L)	Used for digestive issues,

	caryophyllata				cold, and diabetes.
99.	*Cinnamomum zeylanicum*	Lauraceae	Cinnamon	S (L,R)	Used for digestive issues, cold, and diabetes.
100.	*Myristica fragrans*	Myristicaceae	Nutmeg	H (Tub)	Used for digestion, insomnia, and as a carminative.

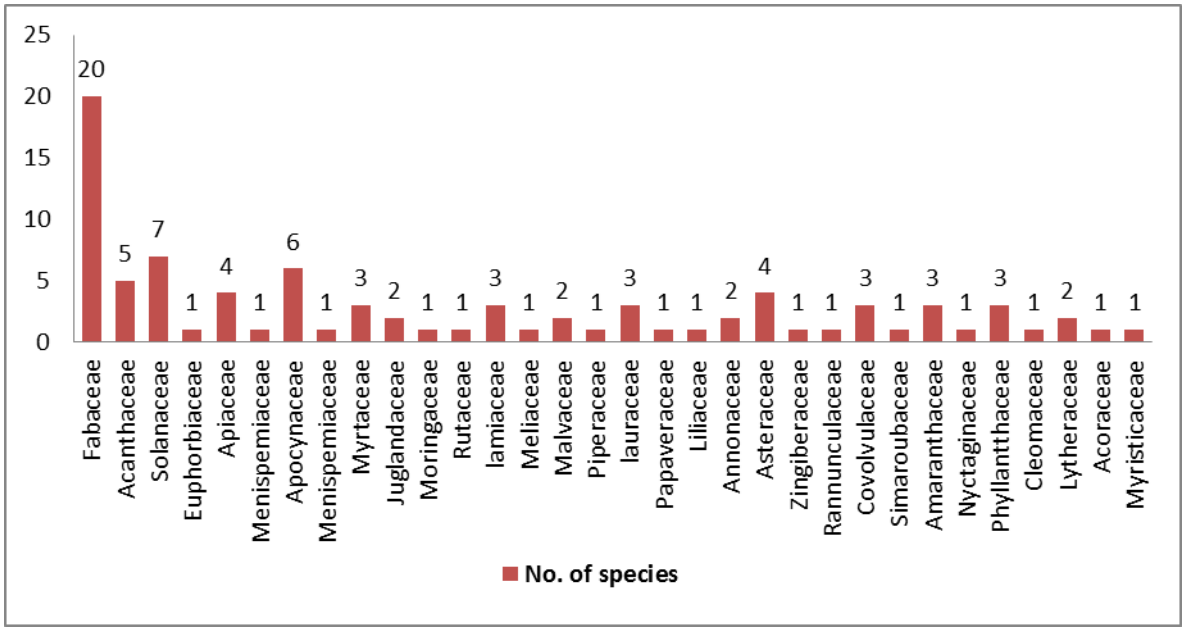

Fig. 3: Family wise distribution of Ntfps showing number of species.

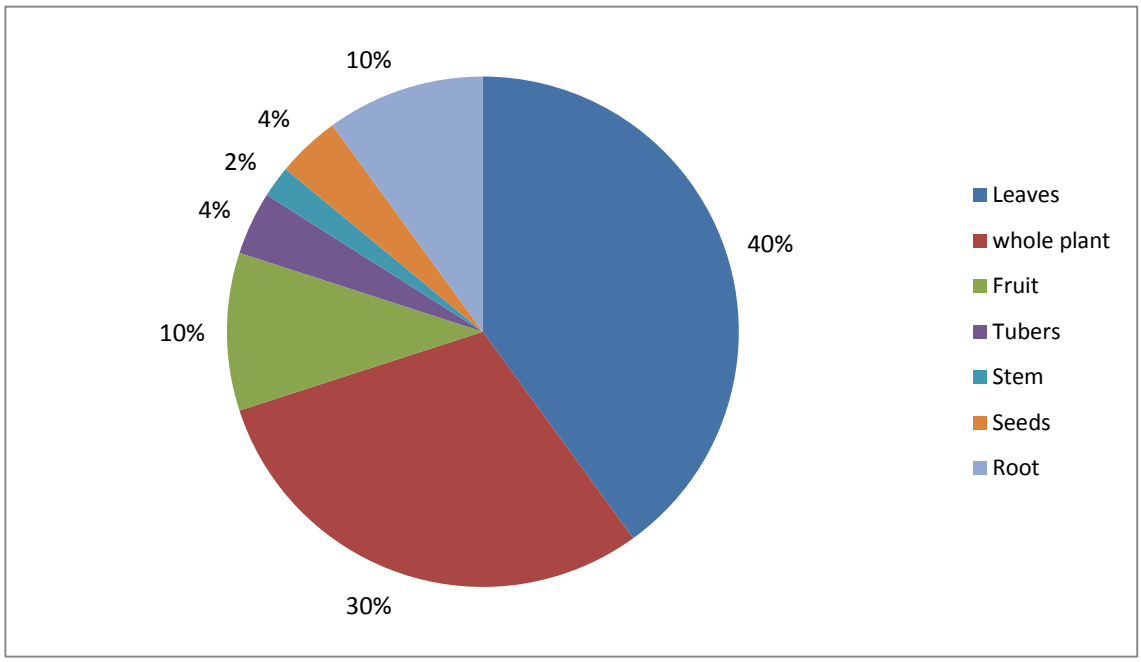

Fig. 4: Plant part used in different disease management (in %).

4. DISCUSSIONS

Non-Timber Forest Products (NTFPs) contribute approximately 40% to the total official forest revenues and provide around 55% of forest-based employment in India, making them a vital component of rural livelihood.[19] The present study highlights the rich ethnobotanical knowledge and diverse use of Non-Timber Forest Products (NTFPs) among the Khadia and Munda communities inhabiting the fringe villages of Jharkhand. The documentation of 100 plant species across 32 botanical families underscores the ecological diversity of the region and its cultural significance in sustaining traditional livelihoods. The predominance of Fabaceae, with 20 species, is consistent with global and regional ethnobotanical patterns, where members of this family are well represented due to their ecological adaptability, nutritional value, and medicinal properties. Other families such as Acanthaceae, Lamiaceae, Phyllanthaceae, Malvaceae, and Apocynaceae also demonstrated considerable representation, reflecting a wide spectrum of plant utilization strategies.

The growth habit analysis revealed that trees formed the largest proportion (35%) of recorded species, followed by shrubs (28%), climbers (22%), and herbs (15%). This distribution suggests that the local communities rely heavily on perennial woody vegetation, which offers a sustainable source of edible and medicinal products with relatively low seasonal dependency. The significant proportion of shrubs and climbers also points towards the importance of understorey and vine resources in meeting daily subsistence and healthcare needs. Non-Timber Forest Products (NTFPs) occupy a central role in the socio-economic, cultural, and ecological landscapes of India. According to Tiwari and Campbell (1995), NTFPs contribute approximately 40% of the total official forest revenues in the country and generate around 55% of all forest-based employment. These figures highlight their crucial role in supporting rural economies, sustaining forest-dependent communities, and supplementing agricultural incomes. In Jharkhand, a state known for its dense forests and vibrant tribal culture, NTFPs are particularly significant in shaping the livelihoods and subsistence practices of indigenous communities. The present study, which focuses on the Khadia and Munda communities residing in fringe villages, sheds light on the extensive ethnobotanical knowledge that underpins their reliance on forest resources and demonstrates the remarkable biodiversity of the region.

The documentation of 100 plant species belonging to 32 botanical families illustrates not only the ecological richness of Jharkhand's forests but also the depth of traditional ecological knowledge embedded within these communities. Such knowledge has been transmitted orally across generations and is closely intertwined with cultural traditions, rituals, and local healthcare practices. The reliance on forests for food, fodder, fiber, medicine, fuelwood, and other subsistence materials ensures that the cultural identity and ecological wisdom of these tribal groups remain strongly tied to the forest ecosystem. Among the recorded species, the predominance of Fabaceae, represented by 20 species, is particularly noteworthy. This pattern aligns with both global and regional ethnobotanical observations, wherein Fabaceae members consistently emerge as highly utilized due to their versatile roles. Fabaceae plants are ecologically adaptable, thriving in varied habitats, which make them accessible to communities throughout the year. Their nutritional value often rich in proteins and essential micronutrients makes them vital as food sources, while their pharmacological properties contribute to widespread medicinal applications. In tribal medicine, Fabaceae species such as *Mucuna pruriens* and *Clitoria ternatea* are used for treating neurological disorders and reproductive health issues, while tree species like Pongamia pinnata provide oil with both medicinal and practical uses.

Other families such as Acanthaceae, Lamiaceae, Phyllanthaceae, Malvaceae, and Apocynaceae were also significantly represented in the study, together illustrating a wide spectrum of plant utilization strategies. Members of the Acanthaceae are often valued for their leafy vegetables and medicinal foliage, while the Lamiaceae contribute strongly to traditional pharmacopoeia due to their aromatic and bioactive compounds. Similarly, Phyllanthaceae species like Phyllanthus emblica (Indian gooseberry) are indispensable in local diets and healthcare due to their high vitamin C content and therapeutic roles. Malvaceae members, such as Hibiscus species, provide edible flowers, fibers, and remedies for common ailments, while Apocynaceae plants are recognized for their alkaloid-rich pharmacological potential. This diverse taxonomic representation reveals the holistic manner in which tribal communities integrate forest products into their subsistence, healthcare, and cultural spheres.

The analysis of growth habits revealed an interesting pattern: trees accounted for the largest proportion of recorded species (35%), followed by shrubs (28%), climbers (22%), and herbs (15%). This distribution highlights the reliance of the Khadia and Munda communities on

perennial woody vegetation, which not only provides sustainable yields of edible fruits, leaves, bark, seeds, and resins but also offers ecosystem services such as soil stabilization, shade, and microclimatic regulation. Trees such as *Madhuca longifolia* (mahua) and *Terminalia arjuna* play a dual role in supporting subsistence and cultural practices. The mahua tree, in particular, is considered sacred and is central to the economy of many tribal households, providing edible flowers, oil-yielding seeds, and timber.

Forest resources play a vital role in the livelihoods of rural people through NTFP-based self-employment. NTFPs such as sal leaves, lac, fuel wood, fodder, neem toothbrushes, mahua flowers, chironji, mangoes, mahua seeds, tamarind, ber, jamun, bamboo corn, kachnar flowers, koinar tender leaves, kusum seeds, chiraita, toont, tendu fruit, and jackfruit are integral to daily livelihood activities and traditional lifestyles. A study on NTFPs by Islam, Quli, Rai, and Sofi (2013) in Bundu block of Ranchi district documents the livelihood contributions of forest resources to tribal communities. NTFP-related activities in forest fringe areas varied from household to household and village to village. The study revealed that the percentage of households involved in NTFP collection ranged from 2% to 100%, while the percentage of households involved in NTFP marketing varied from 2% to 80%.[20] The abundance of NTFPs varied by season, and their collection fluctuated with the seasonal occupations of the local people. Agriculture, which complements the livelihood activities of the people, constituted a major share (36%) of total household annual income. Forest resources contributed 25%, labor 10%, livestock 9%, business/shop 9%, services 7%, and other sources 5%.[20] Also a different study on NTFP-related livelihood dependency in the Simdega district of Jharkhand revealed that the four major NTFPs in this area are mahua, lac, karanj, and chironji. On average, 24% of total household income in the villages comes from the collection, value addition, and sale of NTFPs.[21] In contrast, the Bedo block is predominantly inhabited by poor tribal people for whom agriculture is a primary source of sustenance and income. In the 1960s, a local leader, Simon Oraon, initiated a movement against forest degradation. At a meeting attended by residents from 20 neighboring villages, it was decided that the village of Hariharpur-Jamtoli would form three local forest protection committees: Khaksitoli, Jamtoli, and Berotoli. These self-initiated committees also engaged in activities such as building roads and irrigation structures. As a result, the socio-economic condition of the villagers improved, with an increase in the availability of NTFPs.[22] Both Ranchi's Bundu block and Simdega's Thethaitangar block are endowed with vast natural resources, including minerals, forests, and water bodies, and have rich sources of NTFPs. All

three sectors government, non-government organizations (NGOs), and corporates provide interventions through various schemes and programs to improve practices related to NTFP collection and promote livelihoods among forest and fringe dwellers.

5. CONCLUSIONS

With the steadily growing population, the demand for forest resources particularly non-timber forest products (NTFPs) and timber has significantly increased, resulting in biodiversity loss and posing serious threats to native, endemic, and endangered plant species. Human-induced activities such as road construction, deforestation for jhum (shifting) cultivation, and natural disasters like landslides have emerged as major threats to the region's native biodiversity. To ensure long-term forest sustainability, it is desirable to promote skill development programs and extend financial assistance for the adoption of renewable and alternative energy sources, thereby reducing the dependency on forest-based resources. The study of 100 plant species across 32 families among the Khadia and Munda communities of Jharkhand underscores the ecological and cultural significance of Non-Timber Forest Products in sustaining rural livelihoods. The predominance of Fabaceae, alongside notable contributions from other families, mirrors global patterns of ethnobotanical reliance while also emphasizing the adaptability of these plants to diverse ecological conditions. Growth habit analysis further illustrates the strategic use of perennial woody vegetation, shrubs, climbers, and herbs in meeting dietary, medicinal, and cultural needs. Ultimately, this ethnobotanical documentation not only enriches our understanding of tribal knowledge systems but also underscores the urgent need for policies that recognize and protect the role of NTFPs in biodiversity conservation, livelihood security, and cultural continuity. In Jharkhand, there is significant potential to improve livelihoods through proper storage and value addition to NTFPs, domestication and commercialization of NTFPs, refinement and organization of marketing systems, indigenous technologies, institutional support for training and skill development, appropriate extension and communication networks, and exploring new forest resource-based livelihood avenues through wood and NTFP-based framework.

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