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Review Article

Mapping Traditional Knowledge Associated with *Celastrus paniculatus* in India Using Geographical Information System (GIS)

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ABSTRACT

Introduction: The traditional knowledge mapping of *Celastrus paniculatus* in India using Geographical Information System (GIS) collects and compiles the data about the use and distribution status of *C. paniculatus* in India. The present review gives an idea about the ethnomedicinal importance of *C. paniculatus*. This review provides an idea about the status of *C. paniculatus* in India and aims to make awareness about the conservation of such traditionally and ethnomedicinally important species. ***Methods:*** The ethnomedicinal uses of *C. paniculatus* across several local communities and tribes in India were located on a Quantum GIS 2.10.1-Pisa (Q.GIS) and Google Earth. ***Results:*** The present study resulted in documenting the traditional knowledge mapping of *C. paniculatus* in India. Forty four localities in India revealed 101 indigenous communities identifying *C. paniculatus* by 28 vernacular or local names. *C. paniculatus* is used against almost seventy various ailments. Root, leaves, bark, seed and oil are used against various diseases. ***Conclusion:*** The present study provides a new way for ethnobotanical realm.

KEYWORDS

Ethnobotany , GIS, Jyothishmati, Traditional Knowledge

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The Celastraceae family include a woody climbing shrub species,*C. paniculatus*Willd distributed in China, Malaysia, Philippines, Thailand, North East of Australia and native to India.[1] Ayurveda suggests that *C. paniculatus* stimulate medha (intellect) and promotes smruthi (memory) hence Ayurveda identifies it as Jyothishmati.[2] *C. paniculatus* is mostly used by the tribes, females being more knowledgeable. They have vast knowledge on the properties and uses of *C. paniculatus* in treating diseases like white discharge, burning sensation, blood purification after delivery, and for inducing menstruation and abortion. Root, leaves, bark, seeds and oil are used against various diseases.[3] It is commonly known as Black seed oil plant.[2] This has several medicinal properties like abdominal disorder, abortion, amenorrhoea; antidiabetes, as aphrodisiac, arthralgia, arthritis, asthma, beriberi, bitter, blemishes, blood circulation, brain tonic, bronchitis, body pain, cancer, cardiac debility. *C. paniculatus* belongs to family Celastraceae, it is a climbing shrub with a height of 18m. It is widely spread across in India with an altitude of 1800 m, with reddish brown slender elongated branches and the stem is approximately 23cm in diameter which are covered with lenticles, simple, alternate, oblong and elliptic leaves, paniculate type of inflorescence with unisexual flowers[4]. In *C. paniculatus*, the propagation is done through seeds[5].

This study introduces a method to collect and analyze available information reported on ethnomedicinal uses, status and distribution of various herbs/ extracts used for treatments. It paves a new way to Geo-tag traditional knowledge using Geographical Information System (GIS) and thereby preserve it. Traditional knowledge is lost from generation to generations and it is difficult to protect it from content loss. Still today there is no perfect standard to identify, collect and analyze indigenous knowledge. Knowledge based on tradition provides an opportunity for successful conservation of resources and sustainable development. So there arises the need of ethnobotanical study for the compilation of traditional knowledge.

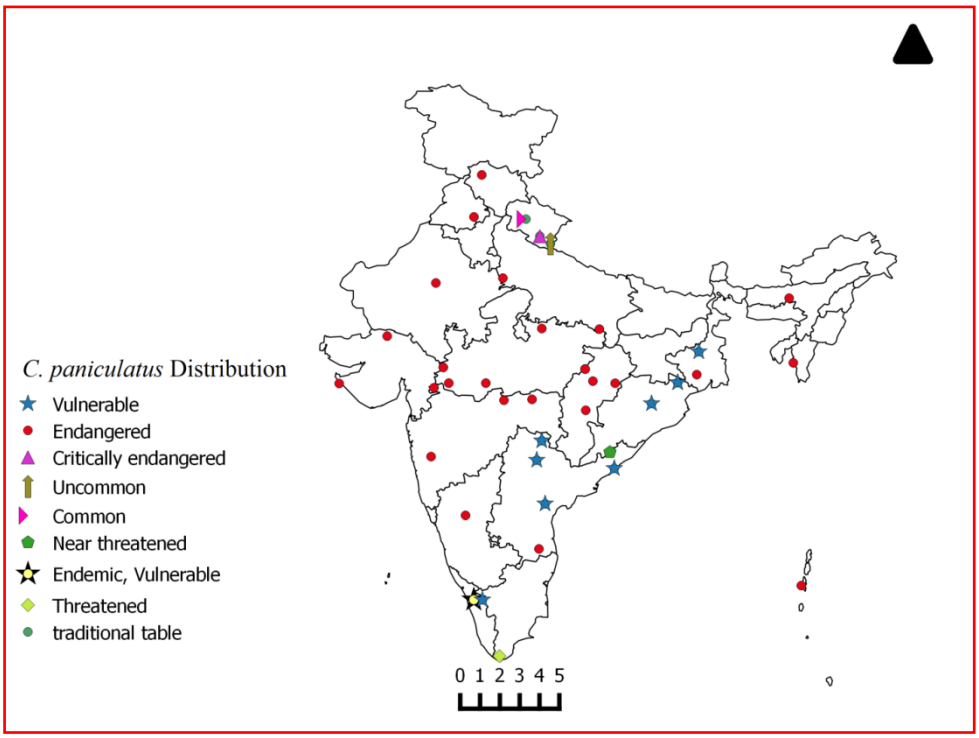
MATERIALS AND METHODS

The present study were conducted by collecting the ethno medicinal uses of *C.paniculatus* from online scientific journals and reports using advanced search word as "celastrus". The information pertaining local name, medicinal use, tribes, status, locality, parts used of *C.paniculatus* from each article were extracted and finally compiled. Later the ethno botanical uses of *C. paniculatus* across various indigenous communities in India were geo-tagged on a Quantum GIS 2.1.0 'Pisa' (Q.GIS) platform. The database created during this study was converted as kml file and it was integrated with Google Earth for data visualization.

RESULTS AND DISCUSSION

Mapping the traditional knowledge of *C. paniculatus* (Figure 1) in India has compiled the diversified ethno botanical utility of the species. Hundred and one indigenous communities residing in Forty four localities identify *C. paniculatus* by 28 vernacular or local names. Root, leaves, bark, seed and oil of *C. paniculatus* was reported to cure almost seventy ailments. Table 1 summarises the ethno medicinal uses of *C. paniculatus* reported from different regions of India. *C. paniculatus* is an endemic, species of Indian sub continent. The present study compiled the reported population status of the species across India. Table 2 summarises the distribution status of *C. paniculatus* in India (Figure 2 and 3).

Figure 1. Reported distribution status of *Celastrus paniculatus*in different regions of India



India is one of the largest Traditional Knowledge holding developing countries in the world[6]. Currently traditional knowledge is under serious of threat in many parts of the India. Hence documentation of traditional knowledge is essential for effective utilization and restoration of such resources. This will not only help to improve the health care system but also the ecological sustainability and utilization of potential medicinal plant species.

The present study on Traditional Knowledge mapping associated with *C. paniculatus* using GIS is an effective strategy against bio-piracy[7] . *C. paniculatus* is listed as endemic, endangered, vulnerable, and critically endangered in various parts of India. Hence, urgent efforts are needed towards conservation of *C. paniculatus* and its associated traditional knowledge from endangerment in India

Table 1. Ethnobotanical uses of *Celastrus paniculatus* by various indigenous communities in India

SN	State	Study Region	Local Name	Ethnic Groups	Part Used	Type Of Uses
1.	Andaman And Nicobar Islands	Andaman And Nicobar Islands	Jyothishmati	Local People	Root, Stem, Leaves, Flowers, Fruits, Barks, Seed	Opium Antidote, Stimulant, Rheumatic Pain, Leprosy, Abortion, Leucoderma, Bitter, Paralysis, Beriberi [8]
2.	Andhra Pradesh	North Coastal Andhra Pradesh	Jyotishmati	Local People	Root	Antidiabetic[9]
3.	Andhra Pradesh	Visakhapatnam	Teegapalleru	Local People	Root, Leaf, Seed	Venereal Diseases, Headache, Skin Diseases, Hair Care[10]
4.	Andhra Pradesh	Khammam	ManerTeega, TeegaPalleru	Koyas, Kondareddis, Lambadas	Leaves	Insect Bite[11]
5.	Andhra	Tiruppati	Jyotishmati	Local People	Seed	Muscular pain[12]

	Pradesh					
6.	Assam	MyongArea,Morigaon	Kunkunilata	Lalung	Seed,Oil	Used in infected part, Leprosy[13]
7.	Chhattisgarh	BhupdeopurForest,Raigarh	Kujur	Baigas,Baidyas	Root, Oil, Bark, Seed	Epilepsy, Headache, Joint pain, Rheumatism, Cough, Chest pain, Abortion[14]
8.	Chhattisgarh	Bilaspur District, Kanker District	Malkagni	Birhor, Pahadi Korwa, Baiga, Uraon, Kamar, Dhurva And Kanwar	Root	Leprosy[15]
9.	Chhattisgarh	Bilaspur, Dhamtari	Malkangni	Local People	Seed	Abortion, Leprosy, Paralysis, Body Pain, Fever, Dysentery, Diarrhoea[16]
10.	Eastern Ghats	Eastern Ghats	Karsona	Local People	Seed	Rheumatism[17]
11.	Gujrat	Banaskantha District	Malkangni	Koli, Deviputra, Maldhari, Adivasi	Seed	Rheumatism, Chronic Lumbago[18]
12.	Haryana	Ambala District	Malkanghi	Local People	Seed, Bark	Paralysis, Leucorrhoea[19]
13.	Himachal Pardesh	Jawalamukhi, District Kangra	Sankhiran	Local People	Seed	Cough and Bronchitis[20]
14.	Himalaya	Himalaya	Jyotishmati	Protoaustroloids, Munda, Kiratas, Mongoloid, Indoaryans, Khasas, Saka	Fruit, Seed	Haemorrhoids, Piles, Gout, Rheumatism, Snakebite, Wound, Dysentery, Diarrhoea, Leprosy[21]
15.	Karnataka	Coastal Karnataka	GangammaBalli	Koraga, Kunbi, Malekudiya, Gowli, HalakkiVokkaliga, Siddi	Root	Skin Problems, Body pain, Urino Genital problems, Gastro Intestinal Problems, Respiratory problem, Animal Bites[1]
16.	Kerala	Attappady	KangogeChedi	Irular, Mudugar, Kurumbar	Tender Leaf	Wound Healing[22]
17.	Kerala	Wayanad	Jyothishmati	Paniya, Adiya, Kattunayika, Kuruma	Root,Bark, Leaves, Seed	Body pain,To Eradicate Worm From Stomach, Early Cure Of Burns And Boils, Arthritis, Anti venom Against Snake Poison, White Discharge, Burning Sensation, Gout, Rheumatism, Inflammation[3]
18.	Madhya Pradesh	Jhabua	Kangan	Bheel, Bhilala and Pataya	Seed	Rheumatism[23]
19.	Madhya Pradesh	Satpuda Mountain	Malkagani	Local People	Seed	Paralysis, Leprosy, Asthma, Scabies, Rheumatism[11]
20.	Madhya Pradesh	Chhindwara, Betul District	Malkangni	Bichhua, Tamia, Junnardeo, Harrai, Betul, Ghora, Dongri, Bhaisdehi, Gonds, Athner, Kol, Chicholi, Santal, Bhomij, Bhuyan, Sounti	Seed	Rheumatism [24]

				Bathuri, Kharia, Mankdias, Pauri Bhuyan, Saharias, Mahalis		
21.	Madhya Pradesh	Vindhyan Plateau, Sidhi District	Malkangani	Gond, Baiga, Kol	Seed	Leprosy[25]
22.	Madhya Pradesh	Chhatarpur District	Malkagni	Gond, Bhil, Bediya	Seed	Epilepsy[26]
23.	Madhya Pradesh	Satpura Plateau	Vadangul	Baiga, Bhariya, Birhor, Gond, Korku, Pardhi	Seed	Aphrodisiac[27]
24.	Madhya Pradesh	Amarkantak Forest Area	Malkangni	Baiga, Panika, Gonds, Kol	Leaves	Liver Disorders[28]
25.	Madhya Pradesh	Amarkantak	Malkangani	Gond, Bhil, Bediya, Baiga, Korku, Halba, Kaul, Mariya	Seed	Abdominal Disorder, Leprosy, Skin Disease, Asthma, Paralysis, , Leucoderma, Cardiac Debility, Inflammation[29]
26.	Madhya Pradesh	Jhabua	Kangan	Bheel, Bhilala, Pataya	Root	Pimple, Blemishes[23]
27.	Maharashtra	Purandhar	Malkangni	Vaidoos	Seed	Joint Pain[30]
28.	Maharashtra	Amaravati District	Pingvel	Korku	Flower, Leaf	Stroke, Menstrual Disorders[31]
29.	Maharashtra	Nandurbar District	Malkangani	Pawra	Seed	Joint Pain, Paralysis, For Muscle Tone Up[32]
30.	Maharashtra	West Vidarbha Region	Jyotishmati	Koraku, Gawli, Gond, Ratthya, Banjara, Kolam	Fruit, Seeds	Brain Tonic[33]
31.	Odisha	Mayurbhanj	Pingu, Kujri, Malkangini, Malkagni, Grism, Sundari, Kujari	Munda, Gond, (Nayak), Kharia, Mahanto, Kolho, Santhal, (Majhi), Lodha Kol (Kolho), Bhumij, Bhuyan, Kumhar, Bathudi	Seed	Gout, Rheumatism, To relieve pain and proper circulation of blood in the body[34]
32.	Odisha	Odisha	Jyothishmati	Dangaria Kandha, Damba, Gonda, Bhuyan, Khadia, Santal	Leaf, Bark, Fruit, Seed	Paralysis, Leprosy, Asthma, Scabies, Rheumatism[1]
33.	Odisha	Odisha	Karsano/ Malkangni	Local People	Seed,Leaf	Rheumatism[35]
34.	Odisha	Mayurbhanj District	Pengu	Local People	Seed, Bark, Oil	Mosquito repellent, Acute stomach pain[36]
35.	Rajastan	Rajastan	Vadangul	Local People	Seed	Improving sexual performance and problem Of sexuality[37]
36.	Rajastan	Kolipura range,Mukundara Hills National Park	Malkangani, Jyotismati	Local People	Seed,Oil	Cough, Asthma, Leprosy, Headache, Ulcers, Scabies, Leucoderma[38]
37.	Tamilnadu	Puzhayaru Riverbank , Kanyakumari	Valuluvai	Local People	Seed	Stomach Problems[39]
38.	Telangana	Adilabad District	ManeruTiga	Kolams, Naik pods, Thotis, Chenchus, Mathuras, Pardhans, Gonds	Fruits	Dysentery[11]
39.	Uttarakhand	Garhwal Himalaya	Malkangni	Local People	Seed	Wounds, Rheumatic Pain, Eye

						Diseases [40]
40.	Uttarakhand	Siwalik, Garhwal Himalaya	Malkuni, Umjan	Tharus, Bhoxas, Gujjars, Raji, Jaunsaris	Seed, Leaves, Bark	Rheumatism Dysentery[41]
41.	Uttarpradesh	Sonbhadra, Varanasi, Kheri	Umjan, Mujhani, Malkangani, Kakundan	Gond, Kol,Tharu	Seed	Tumor Cancer, Rheumatism, Gout Joint Pain[42]
42.	West Bengal	PaschimMedinipur District	Jayotismoti, Kujri, Malkangni, Kujari	Santal, Lodha, Munda, Oraon	Roots, Bark	Nervine Tonic Constipation. Abortifacient[43]

Figure 2. Traditional Knowledge Mapping of *Celastrus paniculatus* in India

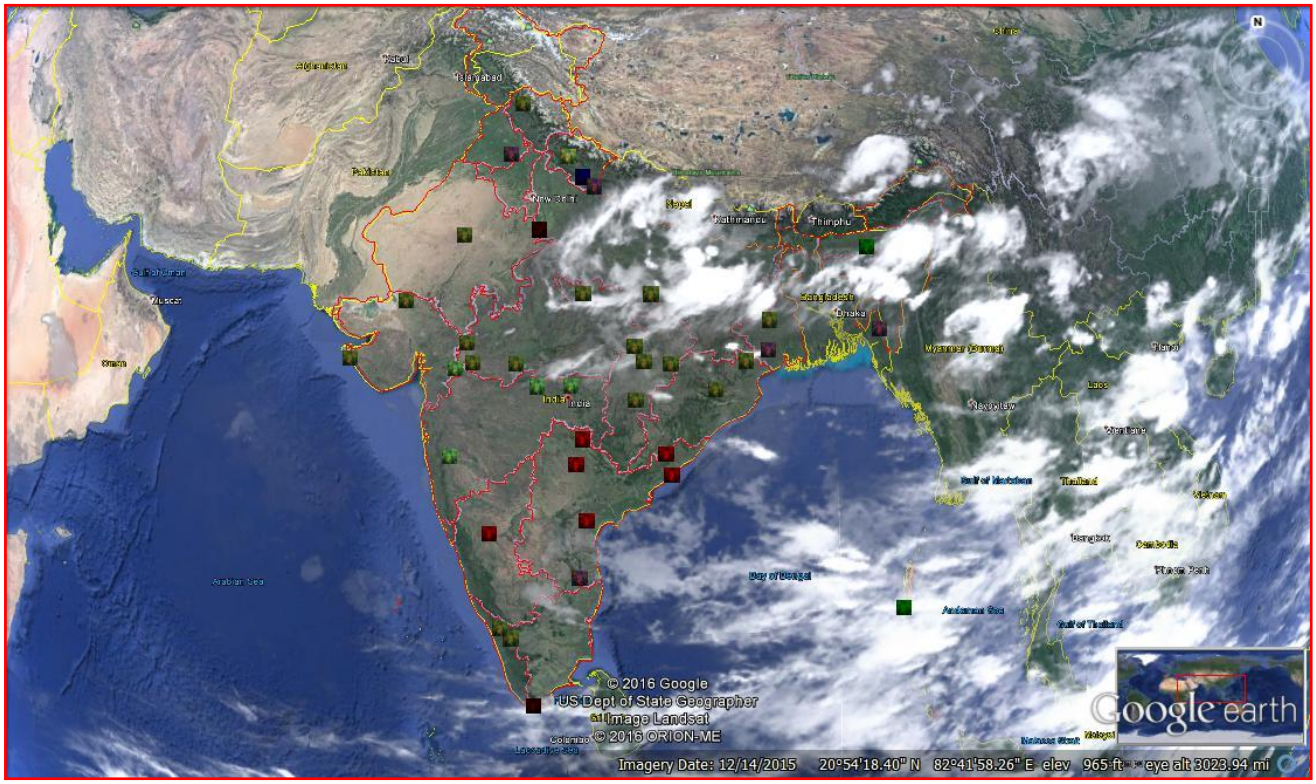
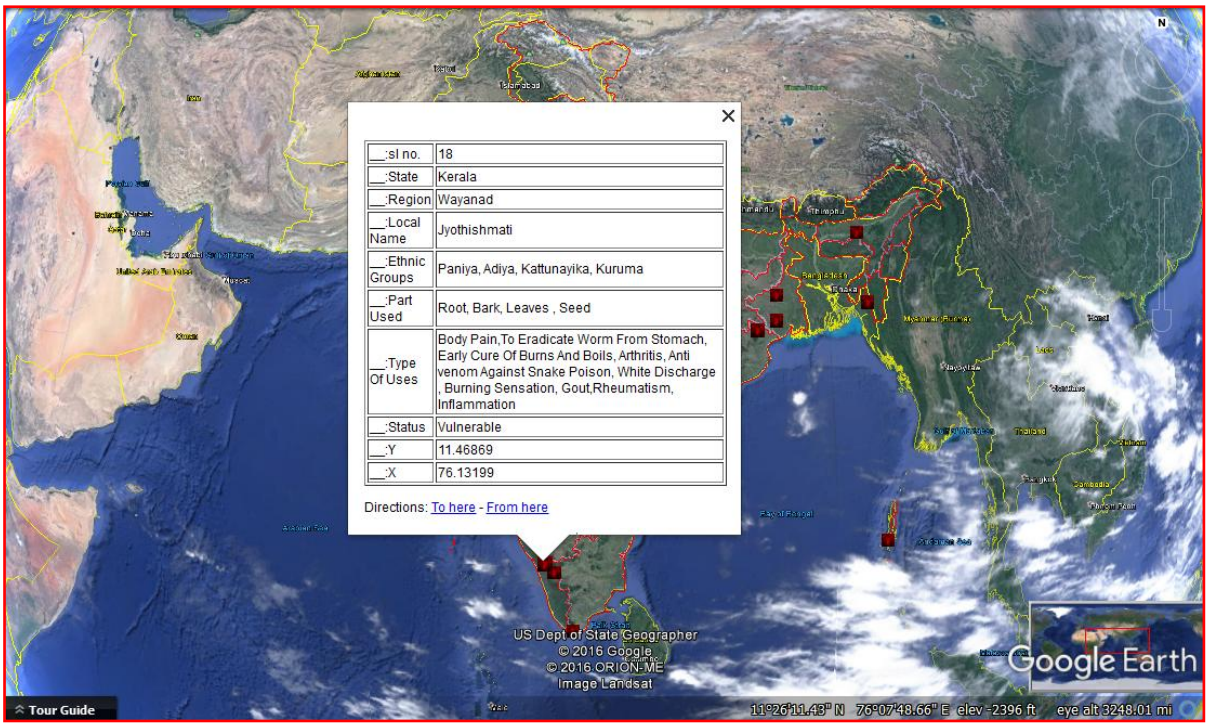


Table 2. Distribution status of *Celastrus paniculatus* in various localities in India

SN	State	Region	Status
1.	Andaman And Nicobar Islands	Andaman And Nicobar Islands	Endemic[44]
2.	Andhra Pradesh	North Coastal Andhra Pradesh	Near threatened[1,45]
3.	Andhra Pradesh	Visakhapatnam	Near threatened[1,45]
4.	Andhra Pradesh	Khammam	Near threatened[1,45]
5.	Andhra Pradesh	Tiruppati	Endangered[12]
6.	Assam	MyongArea,Morigaon	Endemic[46]
7.	Chhattisgarh	Bhupdeopur Forest, Raigarh	Vulnerable[1]
8.	Chhattisgarh	Bilaspur District, Kanker District	Vulnerable[1]
9.	Chhattisgarh	Bilaspur, Dhamtari	Vulnerable[1]
10	Eastern Ghats	Eastern Ghats	Near Threatened[17]
11	Gujrat	Banaskantha District	Vulnerable[45]
12	Haryana	Ambala District	Endangered[47]
13	Himachal Pardesh	Jawalamukhi, Kangra	Vulnerable[45]
14	Himalaya	Himalaya	Endangered[45]
15	Karnataka	Coastal Karnataka	Near threatened[1]
16	Kerala	Attappady	Vulnerable[1]

17	Kerala	Wayanad	Vulnerable[1]
18	Madhya Pradesh	Jhabua	Vulnerable[1,45]
19	Madhya Pradesh	Satpuda Mountain	Vulnerable[1,45]
20	Madhya Pradesh	Chhindwara , Betul	Vulnerable[1,45]
21	Madhya Pradesh	Vindhyan Plateau, Sidhi	Vulnerable[1,45]
22	Madhya Pradesh	Chhatarpur	Vulnerable[1]
23	Madhya Pradesh	Satpura Plateau	Vulnerable[1]
24	Madhya Pradesh	Amarkantak Forest Area	Vulnerable[1]
25	Madhya Pradesh	Amarkantak	Vulnerable[1]
26	Madhya Pradesh	Jhabua	Vulnerable[1]
27	Maharashtra	Purandhar	Least concerned[1]
28	Maharashtra	Amaravati District	Least concerned[1]
29	Maharashtra	Nandurbar District	Least concerned[1]
30	Maharashtra	West Vidarbha Region	Least concerned[1]
31	Odisha	Mayurbhanj	Vulnerable[1]
32	Odisha	Odisha	Vulnerable[1]
33	Odisha	Odisha	Vulnerable[1]
34	Odisha	Mayurbhanj District	Vulnerable[1]
35	Rajastan	Rajastan	Vulnerable[45]
36	Rajastan	Kolipurarange, Mukundara Hills National Park	Threatened[38]
37	Tamilnadu	Puzhayaru Riverbank, Kanyakumari	Threatened[39]
38	Telangana	Adilabad District	Near threatened[48]
39	Uttarakhand	Garhwal Himalaya	Common[40]
40	Uttarakhand	Siwalik, Garhwal Himalaya	Uncommon[41]
41	Uttarpradesh	Sonbhadra,Varanasi, Kheri	Critically Endangered[42]
42	West Bengal	PaschimMedinipur District	Endangered[43]

Figure 3. Pop Up of Wayanad[3] (Table 1: SN 17)



CONCLUSION

The present study provides a new way for ethnobotanical realm. Traditional Knowledge mapping associated with *C. paniculatus* in India has provided geospatial information on the distribution of *C. paniculatus* which is useful for effective conservation of the plant species.

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REFERENCES

1. Misra RC, Kumar S, Pani DR, Bhandari DC. Empirical tribal claims and correlation with bioactive compounds: Astudy *on Celestrus paniculata* Willd., a vulnerable medicinal plant of Odisha. Indian Journal of Traditonal Knowledge 2012;11(4):615-22.
2. Deodhar KA, Shinde NW. *Celastrus paniculatus*: Traditional uses and Ethnobotanical study. Indian Journal of Advances in Plant Research 2015;2(1):18-21.
3. Sujana KA, Joseph J. Ethnomedicinal Uses of *Celastrus paniculatus* Willd. Known To Four Tribal Communities of Wayanad District Of Kerala, India. International Journal of Research in Ayurveda & Pharmacy 2012;3(4):573-5.
4. Suttee A, Bhandari A, Singh CB, Sharma A. Pharmacognostical and phytochemical evaluation of *Celastrus paniculata*. International Journal of Pharmacognosy and Phytochemical Research 2013;4(4): 227-33.
5. Surya KP, Smitha RB, Anoop KP, Kumar PR, Madhusoodanan PV. Induction of seed germination in the RET medicinal plant, jyothishmathi (*Celastrus paniculatus* Willd.). International Journal of Plant, Animal and Environmental Sciences 2015;5(3):33-40.
6. Poorna RL, Mymoon M, Hariharan A. Preservation and protection of traditional knowledge–diverse documentation initiatives across the globe. Current Science 2014;107(8):1240.
7. Sarojkumar V, Jaishanker RN, Annamalai A, Sooraj NP. Ethnobotany and distribution status of *Ensete superbum* (Roxb.) Cheesman in India: A geo-spatial review. Journal of Ayurvedic and Herbal Medicine 2015;1(2):54-8.
8. Ghosh A. Survey of Ethno-medicinal Climbing plants in Andaman and Nicobar Islands, India. International Journal of Pharmacy & Life Sciences 2014;5(7): 3671-7.
9. Roja MN, Satyavani S, Sadhana N, Nikitha N, Padal SB. A review on ethnomedicinal plants having antidiabetic activity in north coastal Andhra Pradesh, India. Advances in biology & biomedicine 2014;1(1):1-9.
10. Padal SB, Satyavathi K. Phytomedicinal flora and their folk claim of Visakhapatnam district agency, Andhra Pradesh, India. IOSR Journal of Environmental Science, Toxicology and Food Technology 2013;3(5):9-16.
11. Reddy KN, Reddy CS, Raju VS. Ethnomedicinal observations among the Kondareddis of Khammam District, Andhra Pradesh, India. Ethnobotanical leaflets 2008;12:916-26.
12. Sandhyarani G, Ramesh A, Naik B. Study on ethno-medico-botany of some plants of Tirupati district of Andhra Pradesh, India. European Journal of complementary and alternative medicine 2014;1(1):35-7.
13. Deka S J, Deka SP. Survey of medicinal plants used against leprosy disease by the tribal (Lalung) people of Myong area of Morigaon District, Assam, India. Plant Archives 2007;7(2):653-5.
14. Naidu VL, Bahadur AN, Kanungo VK. Medicinal plants in Bhupdeopur forest, Raigarh Chattisgarh Central India. Int J Med Arom Plants 2014;4(1):6-15.
15. Tiwari AK. Indigenous knowledge for treating skin disease in some selected districts of Chhattisgarh (India), International Journal of Recent Scientific Research 2015;6(2):2654-7.
16. Tirkey A, Nagvanshi D, Sahu M. Collection and conservation of endangered medicinal plant species diversity for maintaining ecological balance. Recent Research in Science and Technology 2014; 6(1): 167-70.
17. Pattanaik C, Reddy CS, Reddy KN. Ethno-medicinal Survey of Threatened Plants in Eastern Ghats, India. Our Nature 2009;7(1): 122-8.
18. Patel PK, Parekh PP. Therapeutic uses of some seeds among the tribals of banaskantha district, Gujarat, India. Rom J Biol – Plant Biol 2013;58(1):79–82.
19. Vashistha BD, Kaur M. Floristic and ethno botanical survey of Ambala District, Haryana. International Journal of Pharma and Bio Sciences 2013;4(2):353-60.
20. Sharma A, Santvan VK, Sharma P, Chandel S. Studies on Traditional Knowledge of Ethnomedicinal Plants in Jawalamukhi, Himachal Pradesh, India. International Research Journal of Biological Sciences 2014;3(10):6-12.
21. Kumari P, Joshi CG, Tewari ML. Biodiversity Status, Distribution and Use Pattern of Some Ethno-Medicinal Plants. International Journal of Conservation Science 2012;3(4): 309-18.
22. Latheef A, Kumar SP, Remashree AB. Ethnomedicine used for treating cuts and wounds by the tribes of Attappady, Kerala. International Journal of Herbal Medicine 2014;2(2):1-8.
23. Wagh VV, Jain AK. Herbal remedies used by the tribal people of Jhabua district, Madhya Pradesh for the treatment of joint diseases. Inter J Phytotherapy 2014;4(2):63-6.
24. Landge LJ, Kalse AT. Indigenous herbal medicines used by tribal people in Satpuda Mountain. International Scientific Journal 2014;1: 65-9.
25. Singh P, Maurya SK, Nigam G. An ethnomedicinal study of plants used for the treatment of various skin problems in the Sidhi district of Madhya Pradesh, India. Biolife 2014;2(3):880-4.
26. Sharma J, Gairola S, Gaur RD, Painuli RM, Siddiqi TO. Ethnomedicinal plants used for treating epilepsy by indigenous communities of sub-Himalayan region of Uttarakhand, India. Journal of ethnopharmacology 2013;150(1):353-70.
27. Malviya N, Jain S, Gupta VB, Vyas S. Indigenous herbal remedies used by tribals of Madhya Pradesh for improving their sexual performance and problem associated with sexuality, International Journal of Research in Ayurveda and Pharmacy 2011;2(2):399-402.
28. Kapale R, Kumar M. Medicinal Plants of Amarkantak Balco Open Cost forest Area, India, Pharmacology online 2011;3:1290-5.
29. Srivastava A, Patel SP, Mishra RK, Vashistha RK, Singh A, Puskar AK. Ethnomedicinal importance of the plants of Amarkantak region, Madhya Pradesh, India. Int J Med Arom Plants 2012;2(1):53-9.
30. Bhosle SV, Ghule VP, Aundhe DJ, Jagtap SD. Ethnomedical Knowledge of Plants used by the Tribal people of Purandhar in Maharashtra, India. Ethnobotanical Leaflets 2009;13: 1353-61.
31. Jagtap SD, Deokule SS, Bhosle SV. Some unique ethnomedicinal uses of plants used by the Korku tribe of Amravati district of Maharashtra, India. Journal of Ethnopharmacology 2006;107(3): 463-9.
32. Sourav M, Omkar K, Subhash D, Swati G, Abhay H, Suresh J. Oil extraction from medicinal plants by Pawra tribe of Nandurbar district (Maharashtra): Value addition and sustainable utilization with the aid of Ayurved. Indian Journal of Traditional Knowledge 2013;2(2):272-6.
33. Bokhad MN, Rothe SP. An overview of medicinally important lianas from dry deciduous forest of West Vidarbha region (M.S) India. Bioscience Discovery 2015;6(2):117-20.
34. Singh H, Krishna G, Baske PK. Plants used in the treatment of joint diseases (rheumatism, arthritis, gout and lumbago) in Mayurbhanj district of Odisha, India. Report and opinion 2010;2(9):22-6.
35. Panda SP, Sahoo HK, Subudhi HN, Sahu AK. Potential Medicinal Plants of Odisha Used in Rheumatism and Conservation. American Journal of Ethnomedicine 2014;1(4):260-5.
36. Panda SK, Rout SD, Mishra N, Panda T. Phytotherapy and traditional knowledge of tribal communities of Mayurbhanj district, Orissa, India. Journal of Pharmacognosy and Phytotherapy 2011; 3(7):101-13.
37. Gupta RB, Ahuja A, Sharma N, Kabra MP. Indigenous Herbal Plants used by tribes of Rajasthan; Improving Sexual Performance and Problem of Sexuality. International Journal of Drug Development & Research 2013; 5(2): 40-46
38. Singh KN, Choudhary K. Studies on documentation and conservation of herbal remedies for neural disorders found in Mukundara hills tiger reserve of Rajasthan. World Journal of Pharmaceutical Research 2015;4(9):749-53.
39. Uma R, Parthipan B. Survey on medico-botanical climbers in Pazhayaru river bank of Kanyakumari District, Tamilnadu. Journal of Medicinal Plants Studies 2015;3(1):33-6.

40. Tiwari JK, Ballabha R, Tiwari P. Some Promising Wild Edible Plants of Srinagar and its Adjacent Area in Alaknanda Valley of Garhwal Himalaya, India. Journal of American Science 2010;6(4): 167- 74.
41. Gaur RD, Sharma J. Indigenous knowledge on the utilization of medicinal plant diversity in the Siwalik region of Garhwal Himalaya, Uttarakhand. Journal of Forest and Environmental Science 2011;27(1):23-31.
42. Prakash A. Uses of some threatened and potential ethnomedicinal plants among the tribals of Uttar Pradesh and Uttrakhand in India. Proceedings of the National Conference on Forest Biodiversity—Earth's Living Treasure, 22 May 2011, Organized by UttarPradesh state Biodiversity Board , Lucknow 2011;93-9.
43. Das PK, Mondal AK. A report to the rare and endangered medicinal plants Resources in the Drydeciduous Forest Areas of Paschim Medinipur District, West Bengal, India. International Journal of Drug Discovery and Herbal Research (IJDDHR) 2012;2(2):418-29.
44. Ghosh A. Survey of Ethno-medicinal Climbing plants in Andaman and Nicobar Islands, India. International Journal of Pharmacy & Life Sciences 2014;5(7): 3671-7.
45. ENVIS Centre on Medicinal Plants [http://envis.frlht.org/index.php]. Bangalore: FRLHT's ENVIS Centre on Medicinal Plants; c2016 [updated 2016 Oct 19; cited 2016 Oct 20]. Available from: http://envis.frlht.org/conservationconcern-species-india.php.
46. Plant diversity, Envis Centre: Assam. Status of environment and related issues, [updated 2016 February 15]. Available from:http://asmenvis.nic.in/Database/Plant_Diversity_833.aspx.
47. Khatri P, Sindhu A, Jamdagni P, Rana JS. Phytochemical and antimicrobial screening of endangered medicinal plants of Haryana, India. Journal of Biology and Nature 2015;3(2):59-66.
48. Reddy KN, Reddy CS. First Red List of Medicinal Plants of Andhra Pradesh, India - Conservation Assessment and Management Planning. Ethnobotanical Leaflets 2008;12:103-7.

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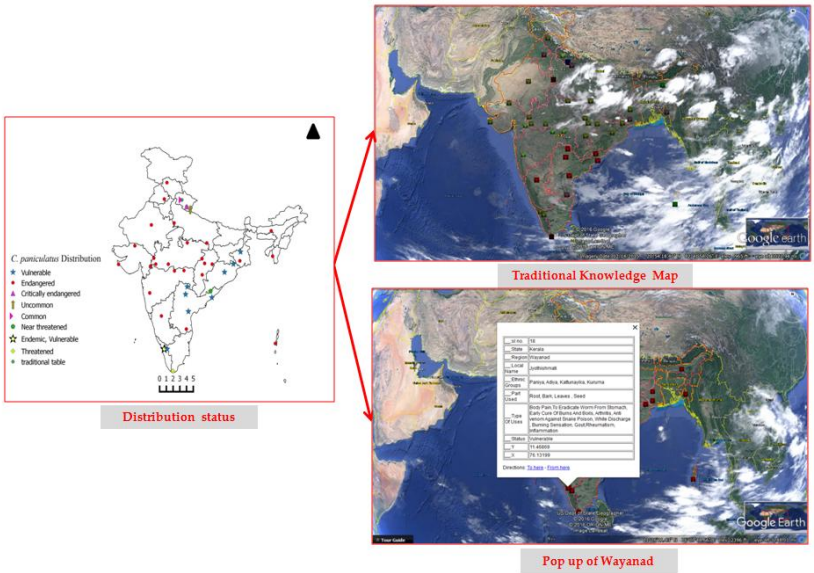
GRAPHICAL ABSTRACT



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