



## Wild edible plants used by Thakar tribe of Gautala- Autram Ghat sanctuary, Aurangabad district, Maharashtra state, India

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### Abstract

The present investigations reports the first hand information about wild edible plants used by Thakar tribe of Gautala – Autram Ghat sanctuary, Aurangabad District, Maharashtra, India. The ethnobotanical survey was conducted among the Thakar tribe of Gautala-Autram sanctuary, through semi structured interview and field survey during June 2008 to August 2010. Data was collected through a combination of tools and technique of questionnaire, focused group interview and discussion. Information about collection, use of wild edible plants, preparations thereof, religious significance and folk tales related to sustainable harvest of plant parts was recorded. The edible value of 25 wild plant species recorded in study area is represented in present paper along with use value index and cultural importance index for each species calculated with standard algorithm proposed by Phillips and Gentry. Our study revealed that.

**Keywords:** thakar tribe, gautala autramghat sanctuary, use report, cultral importance index

### Introduction

Plants are used as the source of food since the ancient times. Tribal communities of Marathwada lives in forest ecosystems and has its unique sociocultural pattern of living with typical food practices. Leafy vegetables growing as wild weeds from agricultural and non-agricultural fields are eaten mainly to supplement their staple food along with locally available Thakar community have treasure of knowledge about wild edible plants growing in area and wild edible plants have been traditionally used as a source of survival by tribal communities but increased overexploitation of wild edibles is causing threat to certain species.

flowers and fruits. Tubers and roots of plant are mainly used as food of famine <sup>[13]</sup>. Tribal communities inhabiting forest areas use wild plants that are nutritionally important due to their high vitamin, mineral and fiber contents <sup>[21]</sup>. Various studies have shown that wild edible plants are more nutritious than conventionally eaten crops <sup>[12]</sup>. Plants selected by tribal communities mainly include root and tuber plants as the forest harbor many of such types. The knowledge about edible plants and their uses is limited to elder people of tribe. Tribal communities living in harmony with nature have still preserved their culture with their unique cultural practices of collecting and cooking wild edible plants.

Present paper reports some of the wild edible plants used by Thakar tribe in Marathwada region of Maharashtra along with their cultural importance and use value. Though attempts have been made to document the diversity and uses of wild edible plants, very few have touched upon the use of wild edible plants and there importance in tribal culture. Present paper is a first-hand information about edible plants of Marathwada region used by 'Thakar' tribe along with various ways of usage.

### Study area

Gautala – Autram Ghat Sanctuary is located in Marathwada region of Maharashtra. It is a part of vast Deccan plateau that occupies a central position in India. The sanctuary is named after 'Gautama Rishi', one of the saint of Vedic times. The study area Gautala – Autram Ghat sanctuary is situated from 200.25°N and 200.37°N latitude to 750.12°E and 750.85°E longitude. The sanctuary covers a total area of 26,061.19 hectares, of which this bowl-shaped hilly terrain has a Reserved Forest Area of 19,706 ha. in Aurangabad district.

Aurangabad division has Balaghat upland ranges to the North and lowland of Ravanghat ranges to the south and southeast which terminates into Godavari valley. Gautala Autramghat sanctuary is formed by Ajantha Ranges which is an out-branch formation of the Sahyadris running along northern boundary of Aurangabad division with general altitude of 800m above mean sea level. There are noted hills like Daulatabad, Ajantha and Chowka in ranges. The highest point of hill is 958 meters and this lies in area of sanctuary.

Gautala Autram Ghat Sanctuary has Southern tropical dry deciduous forest mainly mixed type with chief species of *Tectona grandis* L., *Boswellia serrata* Roxb, *Wrightia tinctoria* L., *Terminalia alata* L., *Terminalia tomentosa* L., *Semicarpus anacardium* L., *Lagerstroemia parviflora* L., *Cassia fistula* L., *Butea monosperma* L., *Madhuca indica* L. Extensive forest clearance and indiscriminate cultivation practices in forest land was observed in study area by local people in region. The region show recognizable tribal population along the forest fringes and also in populated areas of region.

### People

'Thakar' tribe typically live in hilly regions somewhat remote from caste settlements called 'Thakarwadi' in local

dialect; they generally speak a language recognized as 'Thakri' some were able to speak local language. They have their own social organization and control. Tribal men generally less interact with local people come to buy goods of daily needs in local markets but the degree of isolation varies in different communities.

Thakar are forest tribe of Western hill ranges extending from Nasik to Kolaba. This tribe lives in or near forest, but always chooses a particular spot for its hamlet. They are called as farmers of high land [6]. Women wear sari tighter around hips and tucked up so high that the legs and part of thighs are left bare. They do not cover upper part of their body with sari but wear dark red to brown color bodice. They wear heap of heavy necklace of white, blue, red, glass beads. Generally, they prefer silver ornaments. Men wear Dhoti Kudta or Kudta pajama generally of white in colour. Their names are Marathi but some seem to have Gujrathi origin.

Tribal men in community accept that their original roots are in Konkan and Thane area of Maharashtra in Western Ghats and some have maintained their relationship with community men living in these areas. They may be offshoots or few community men might have left their original habitat in Western Ghats due to some reasons or for economic purpose and their forefathers might have migrated to Marathwada and settle here by making smaller settlements. Community speaks a dialect of Marathi called Thakari language which has strong 'Agnri' (dialect of Marathi in Konkan region of Maharashtra) influence. Community men generally are very humble and cordial. Community men confirm that their forefathers were hunters used to hunt rabbit, deer, antelopes, forest birds. In early days of their settlements they use hunting regularly and use hunted animal meat as their daily diet and for special occasion feast. Women of community use to collect yams of plants, fruits, vegetables and seeds of various plants growing in forest areas.

The prohibited degree of blood relatives for marriages beyond the agnates vary according to the custom of community concerned. So far as cross cousin marital alliance are concerned marriage with wife's sister is allowed and brother may marry his brother's wife's sister i.e. two sisters can become sisters in law. Polygamy is not prohibited. Child marriages are rare. But general age of marriage is 14 for girls and 18 for boys.

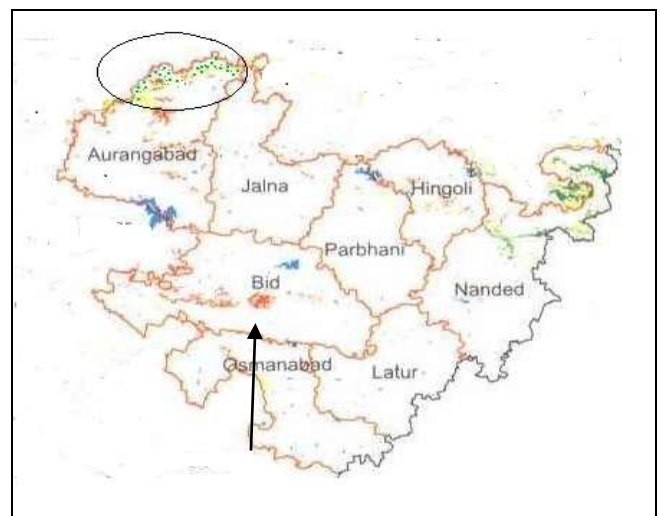
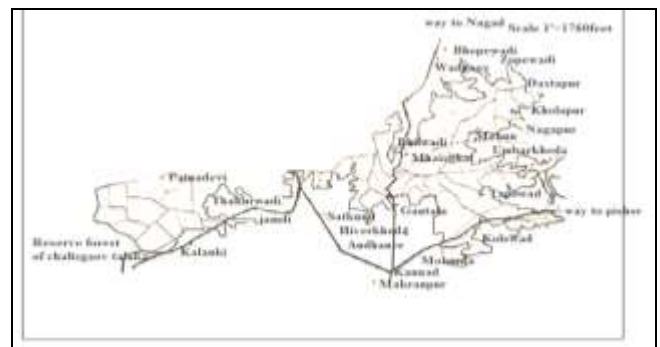
The religious faith of Thakar population is a strange mixture of animism and the higher philosophic tenets of Hinduism and morals. Ill carved stone images of Mhasoba, Bhairoba, Jankai, firangi, Vetar are their names of god.

The fuel wood demand of the local tribes of the forest region is met by wood of *Tectona grandis*, *Terminalia arjuna*, *Garruga pinnata*, *Mitragayna parvifolia*; flowers of *Madhuca indica* (Mahuda) are also used for brewery by distillation process. During flowering season, fruits of Mahuda are fermented for liquor preparation. Similarly, *Butea monosperma* leaves are used for making plates and bowls.

Few ethnobotanical reports on wild edible plants used by tribal communities in Western Maharashtra are available such as (Datar and Vartak 1975 [7]; Gunjatkar and Vartak 1982 [14]; Nilegaonkar *et al.* 1985 [27]; Upadhye *et al.* 1986 [45]; Vartak and Kulkarni 1987 [46]; Kumbhojkar and Vartak 1988) [20]. Reports on North Maharashtra near to study area are (Pawar & Patil 2000 [32]; Patil and Patil 2000 [31]; Sharma

and Mujumdar 2003 [30]; Deshmukh and Shinde (2010) [9]; Jadhav *et al.* (2011) [16]; Reddy 2012 [4]; Dhore *et al.* 2012 [10]; Vijigiri and Bembrekar (2015) [48]; Satpute - (2015) [38]; Oak *et al.* (2015) [28]; Patale *et al.* (2015) [29]; Deshpande *et al.* (2019) [42]. Edible plant reports of central India includes Jha 1963 [40]; Sundriyal 1999 [41]; Kumar and Rao 2007 [47]; Maikhuri *et al.* 2004 [22]; Rajasab and Isaq (2004) [33]; Sundriyal and Sundriyal 2003 [24]; Bandyopadhyay and Mukherjee 2009 [39]; Some nutraceutical report of wild edible plants are also reported Masuda *et al.* 2003 [25]; Maikhuri, *et al.*, 2004 [22]; Sinha and Lakra 2007 [34]; Dangwal *et al.* 2014 [8].

The lack of ethnobotanical research in the Gautala Autram ghat sanctuary in Marathwada, we studied the use of wild edible plants used by Thakar community living in rural mountainous region called Thakarwadi.



**Fig 1:** Location of Gautala - Autram Sanctuary area in Aurangabad district

## Method

Field survey was carried out among Thakar and Bhil communities in region. Total of 112 tribal men and women between the age group of 30 - 70 were interviewed and information about use of wild edible plants, plant part used, tribal names and recipes thereof were recorded. Data gathered by interviewing randomly selected respondents. Visits were made to the study area accompanied by local knowledgeable individuals. Information about collection, religious significance and folk tales related to sustainable harvest were recorded through semi-structured interviews. Data was collected through a combination of tools and technique of questionnaire, focused group interview and discussion [11]. The mean age of informants was 40

(minimum 30 and maximum 75).

Voucher specimens were collected during collection trips. Specimens were identified with the help of available floristic literature (Flora of Marathwada Naik 1999 <sup>[49]</sup>, Flora of Maharashtra Almeida 2003 – 2006) <sup>[50]</sup>. Voucher specimens have been deposited in herbarium at Department of Botany, S.B.E.S. Science College, Aurangabad. The identification was further confirmed by comparison with that of authenticated specimens deposited at regional herbarium of Department of Botany, Dr.B..A.M.University, Aurangabad. During survey, different sites were visited and habitat degradation status was observed carefully by holding discussions with the local people, who have explained about degradation of forest species in the region.

### Data analysis

To determine the use-value of the local flora, we calculated the use-value (UV) index using the algorithm proposed by Phillips and Gentry <sup>[62]</sup>, modified by Rossato *et al.* <sup>[63]</sup> and Lucena *et al.* <sup>[21,43]</sup>. The calculation was obtained by counting all the uses mentioned by every person for a specific plant and dividing the result by the total number of informants. The use-value corresponds to the average use associated to each species in a specific community:  $UV_s = \frac{\sum U_{is}}{n}$  where  $U_{is}$  is the number of uses mentioned by an informant  $i$ , for each species  $s$  and  $n$  is the number of informants interviewed for each species.

Table 1

Scientific name (voucher number)	Local Dialect/ vernacular name	Family	Habit	Parts Used	Collection period	Reported additional use(s)/other uses if any	UR	CI
<i>Amaranthus tricolor</i> L. (SBES191)	Tandul - kunjra	Amaranthaceae	Herb	Leaves (VEG)	August - November	escaped weed used as vegetable	30	0.26
<i>Aegle marmelos</i> (L.) Co (SBES)	Bel	Rutaceae	Tree	Fruits (BEV)	April - June	Leaves are offered to God, fruit pulp is used to treat diarrhoea	9	0.08
<i>Amaranthus spinosus</i> L. (SBES190)	Kata - mata	Amaranthaceae	Herb	Leaves (VEG)	August – November	-	12	0.10
<i>Basella alba</i> L.var.rubra (L.) Stewart. (SBES455)	Vavding	Basellaceae	Herb	Leaves (SNK)	Throughout the year	Ornamental plant, used to treat kidney stone	30	0.26
<i>Bauhinia purpurea</i> L. (SBES141)	Korel	Caesalpinaceae	Tree	Leaves (VEG)	September	Flowers used in Ayurvedic medicine	3	0.02
<i>Carissa carandas</i> L. (SBES355)	Karvanda	Apocynaceae	Shrub	Fruits (FRT)	May	Unripe fruits are made into pickle	6	0.05
<i>Cassia tora</i> L.(SBES109)	Tarota	Caesalpinaceae	Shrub	Tender leaves, fruits (VEG)	August-December	Seeds used to treat rheumatism	11	0.09
<i>Ceropegia bulbosa</i> Roxb. var. <i>Bulbosa</i> (SBES233)	Halind	Asclepiadaceae	Herb	Tuber (FAM)	November	Used to treat micturination	8	0.07
<i>Coleus barbatus</i> (Andr.)Benth.(SBES250)	Ran - launga	Lamiaceae	Herb	Roots (SPI)	October - November	Used to treat rheumatic disorders	5	0.04
<i>Colocasia esculenta</i> (L.) Scott. (SBES499)	Chimkura	Araceae	Herb	Leaves (SNK)	Throughout the year	Tubers used to treat stings of insects	33	0.29
<i>Cucumis melo</i> var. <i>agrestis</i> Naud. (SBESSBES213)	Shendad	Cucurbitaceae	Climber	Fruits (FRT)	October-January	No medicinal report	10	0.08
<i>Dioscorea oppositifolia</i> L. (SBES202)	Tambul kand	Dioscoreaceae	Herb	Tuber (FEM)	November - December	Tubers are used as tonic	6	0.05
<i>Ehretia aspera</i> Willd (SBES 340)	Datrange	Ehretiaceae	Shrub	Young twigs	August - December	Twigs are rubbed on teeth to color the teeth and strengthening gums	15	0.13
<i>Habenaria gibsonii</i> Hook. (SBES187)	Pandhari divasmavli	Orchidaceae	Herb	Tubers(FEM)	September	Tubers are used as aphrodisiac	4	0.03
<i>Hemidesmus indicus</i> (L.) R. Br. (SBES178)	Kavalmuli	Asclepiadaceae	Shrub	Roots(BEV)	November-December	Roots are used to treat fever	22	0.19
<i>Launaea procumbens</i> (Roxb.) Ramayya and Rajopal. (SBES218)	Pathri	Asteraceae	Herb	Whole plant (VEG)	August-September	Plant used to treat urinary stone	10	0.08
<i>Luffa cylindrica</i> (L.) Roem.	Ghosala	Cucurbitaceae	Climber	Fruits (VEG)	October-December	Medicinal use not reported	32	0.28
<i>Moringa oleifera</i> Lamk. (SBES421)	Shevgi	Moringaceae	Tree	Flowers (VEG)	February-June	Bark,pods are used as medicine	5	0.04
<i>Madhuca longifolia</i> (Koen.) Macbr.var. <i>latifolia</i> (Roxb.) Che. (SBES247)	Moha	Sapotaceae	Tree	Flowers (BEV)	April-May	Leaves are used to make dining plates	8	0.07
<i>Oxalis corniculata</i> L. (SBES490)	Amti	Oxalidaceae	Herb	Whole plant (VEG)	September-November	Leaves are used in ayurvedic medicine	10	0.08
<i>Prosopis cineraria</i> (L.) Druce. (SBES192)	Samdhad	Mimosaceae	Tree	Fruits (VEG)	December – April	Leaves and fruits are used as fodder	7	0.06
<i>Portulaca oleracea</i> L. (SBES180)	Ghol	Portulacaceae	Herb	Whole plant (VEG)	Throughout the year	Plant have cooling effect	45	0.40
<i>Rivea hypocrateriformis</i> (Desv.) Choisy.	Fanji	Convolvulaceae	Shrub	Leaves(VEG)	October to December	Used for fencing the fields	3	0.02

(SBES256)								
Semecarpus anacardium L.f. (SBES175)	Bibba	Anacardiaceae	Tree	Thalamus (FRE)	September - January	Seeds as aphrodisiac	20	0.17
Solanum americanum Mill. (SBES161)	Kamoni	Solanaceae	Herb	Fruits (FRE)	September-January	medicinal use not reported	3	0.02
Sesbania grandiflora (L.) Poir. (SBES 178)	Hadga	Fabaceae	Tree	Flowers (VEG)	February-April	medicinal use not reported	23	0.20

Food categories: VEG vegetables, SNK - snack vegetables, FRE - wild fruits, FEM – food of famine, BEV beverages, SPI – Spices UR Use-report, i.e. number of informants that mention the use of the species in this use-category. CI - Cultural importance index

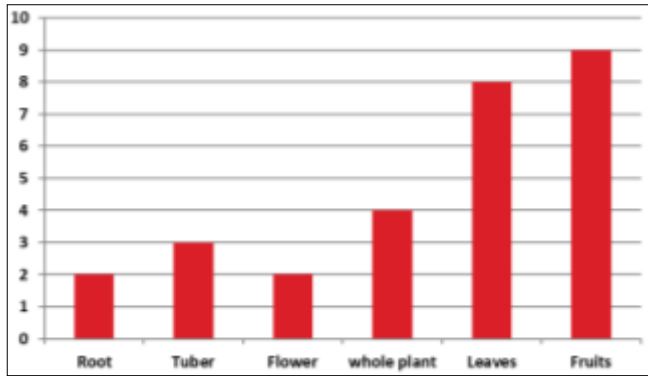


Fig 2: Edible plant part used

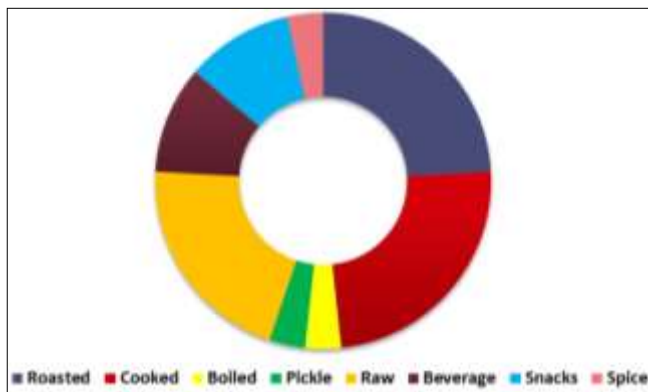


Fig 3: Utilization pattern of wild edible plants

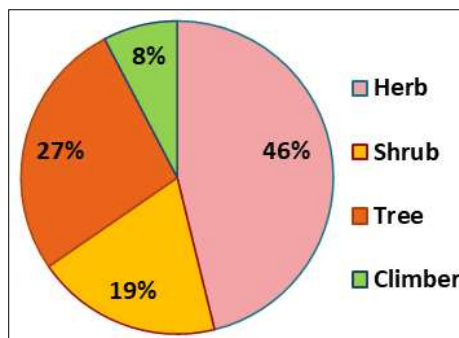


Fig 4: life forms

**Discussion**

‘Thakar’ tribe use wild and cultivated plants as source of nutritious diet. The plants belonging to 22 families and 25 genera have been reported in present investigation. 9 species of fruits, 12 species of plants used as vegetable, flowers of 2 species, 3 species of tubers and 2 species of roots are used as edible. Among these herbs have high usage value (46%) and climbers have lowest (8%) usage. According to CI and Use Value Indexing highest use value of Protulaceae, Amaranthaceae, Basellaceae, Cucurbitaceae, Araceae, was recorded. Most important species according to CI are Portulaca oleracea L, Luffa cylindrica (L.) Roem. Colocasia

esculenta (L.) Scott. Basella alba L.var.rubra (L.) Stewart. The Cultural Importance index (CI) was used to assess the cultural significance of each taxon (Tardi’o and Pardo-de-Santayana 2008) [23]. Fruits eaten raw or can be easily made into different preparations and stored for longer time. The polysaccharide in fruits and vegetables form a major source of fibre in plants and consumption of fiber lowers plasma cholesterol level (Holland *et al.* 1998) [15]. Fruits and vegetables have thus had conferred on them the status of ‘functional foods’, capable of promoting good health and preventing or alleviating diseases (Kaur and Kapoor 2001) [19]. Plant parts are made into different preparations to enhance taste mainly roasted in edible oil or boiled for easy digestion. Among the pattern of usage mainly vegetables are roasted in oil or cooked (24%) and lowest of species (3%) used as spices. Snacks are made by stuffing leaves of edible plants with gram flour or rice flour as in case of Basella alba L.var.rubra (L.) Stewart. and Colocasia esculenta (L.) Scott. Beverage like liqueur of Madhuca longifolia (Koen.) Macbr is prepared by traditional method. Same type of preparation have been reported among tribes of central India [17] and tea prepared by boiling roots of Hemidesmus indicus (L.) R. Br is served for guests on ceremonial occasions during feast. Edible fruits of Carissa carandas L. and roots of Coleus barbatus (Andr.) Benth. are made into pickle by mixing unripe fruits and roots with salt and chili powder and preserved for longer time.

Antioxidants which inhibit the oxidation of organic molecules, are very important not only for food preservation but also for the defense of living systems against oxidative stress [25]. The antioxidant activity was recorded in Amaranthus tricolor L., [1] Madhuca longifolia (Koen.) Macbr [37], Cassia tora L. [25], Colocasia esculenta (L.) Scott [5], Carissa carandus L. [3] Hemidesmus indicus (L.) R. Br [36], Aegle marmelos (L.) Corr [35], Basella rubra L [2].

Many wild edible plants used by ‘Thakar’ tribe are important food for famine. Mainly underground plant parts like rhizome and tubers are collected from wild. Tubers of Ceropegia bulbosa Roxb. var. Bulbosa, Dioscorea oppositifolia L., Habenaria gibsonii Hook. are collected and eaten raw or cooked. Edible plants like Colocasia esculenta (L.) Scott. Cucumis melo var. agrestis Naud., Luffa cylindrica (L.) Roem., Moringa oleifera Lamk., Sesbania grandiflora (L.) Poir. occurs as cultivated plants along the fringes of tribal hamlets collected fresh for cooking. Nutraceutical properties have been reported in Moringa oleifera (Chaudhary and Chaurasia 2017) [44, 64], Sesbania grandiflora (Perumal Siddhuraju *et al.* 2014) [64]

The present investigation indicate that many species used by ‘Thakar’ tribe have multiple uses. Nearly all species have medicinal importance among these are Aegle marmelos [51], Basella alba [52], Cassia tora [53], Ceropegia bulbosa var bulbosa [54], Coleus barbatus [55], Dioscorea oppositifolia [56], Hemidesmus indicus [57], Launaea procumbens [58], oxalis

corniculate <sup>[59]</sup>, *Semecarpus anacardium* <sup>[60]</sup> has reported medicinal value.

### Conclusion

After the systematic ethnobotanical exploration in area about edible plants it can be concluded that the use category fruits have highest use value and flowers have lowest use value. Although number of species used as edible are lower than locally available vegetables; species used by 'Thakar' have considerable specificity with many uses reported are new and uncommon when compared with available ethnobotanical data of region. Wild food plants are typically important during famine as they can be used as substitute for routine diet providing all the nutrients. Nearly all wild edibles used by 'Thakar' tribe are medicinally important so that can be used as food medicine also.

During the survey it was noted that most of the young generation of tribal community lack knowledge about edible plants. Today only few plants are regularly collected as edible many becoming rare mainly due to habitat destruction and extensive harvesting by tribal itself as they are also used as medicine. Exploration of wild edible plants also indicated that densities of many species were low in the forest stands and collection procedure was highly eroding, threatening survival of plant species in near future mainly plants propagating with tuber. Tribal women from study area are found to be familiar with wild edible plants than young adults. They have knowledge about names and occurrence of plants in area. Many wild plants are becoming rare and knowledge of plants is on verge of extinction not being passed on to next generation as young they have less interest about this information.

Young generation of Thakar tribe with changed lifestyle due to modernization and new agriculture practices giving more preference to cultivated vegetables available in local market. Practice of collecting wild edible plant is now becoming rare so there is urgent need to document this information and further nutraceutical analysis of wild edible should be carried out to confirm nutritional value of these plants.

Use of wild edible plants as a supplementary food resource needs thorough investigation, so that economically important species are promoted for domestication and plants can be reared by the community itself. Awareness among tribal for mass cultivation practices of these edible plants is needed.

In Asian nations, total energy and protein intakes have traditionally been lower than in Western nations. In this context, these indigenous foods of tribals will play a vital role towards food and nutritional security of the nation (Sinha and Lakra 2007) <sup>[34]</sup>. There is more vital need now than before to undertake such studies to keep pace with fast modernization in agriculture, forestry, land use and industry; as such developments are eroding natural plant resources. Plant reported here provide basic material for further nutritional research. Some plants may be nutritionally rich some may be poor but that too do not minimize utility of recording information of fast disappearing traditional culture. Exploration and authentication of these plants will provide the boon for conservation and sustainable use of this natural resource.

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### References

1. A Colaco e Clemente and PV Desai. Evaluation of the Hematological, Hypoglycemic, Hypolipidemic and Antioxidant Properties of *Amaranthus Tricolor* Leaf Extract in Rat Tropical Journal of Pharmaceutical Research. 2011; 10(5):595-02.
2. Nirmala A, Saroja S, Vasanthi HR, Lalitha G. Hypoglycemic effect of *Basella rubra* in streptozotocin – induced diabetic albino rats Journal of Pharmacognosy and Phytotherapy. 2009; 1(2):25-30.
3. Aniruddha Sarma, Pranjal Sarmah, Debaleena Kashyap, Snehashish Dutta and Mantu Mahanta Antioxidant Activity and Nutraceutical Property of the Fruits of an Ethno-Medicinal Plant: *Carissa carandas* L. found in Brahmaputra Valley Agro-Climatic Condition. J. Pharm. Sci. & Res. 2015; 7(2):55-57.
4. Mallesh Reddy B. Wild edible plants of Chandrapur dist Maharashtra, India, Indian of Natural Product and resources. 2012; 3(1):110-17.
5. Bhagyashree R Patil, Hussein M Ageely. Antihepatotoxic activity of *Colocasia esculenta* leaf Juice International Journal of Advanced Biotechnology and Research. 2011; 2(2):296-304
6. Census of India: Source, Registrar General, Government of India, 1991.
7. Datar R, Vartak VD. Enumeration of wild edible plants from Karnala Bird Sanctuary, Maharashtra State, Biovigyanam. 1975; 1(2):123-29.
8. Dangwal LR, Singh T, Singh A. Exploration of wild edible plants used by Gujjar and Bakerwal tribes of District Rajouri (J and K), India, Journal of Applied and Natural Science. 2014; 6(1):164-69.
9. Deshmukh BS, Shinde V. Fruits in the wilderness: a potential of local food resources, International Journal of Pharma and Bio Sciences. 2010; 2:1-5.
10. Dhore MM, Lachure PS, Bharsakale DB, Dabhadkar DK. Exploration of some wild edible plants of Digras Tahsil Dist – Yavatmal, Maharashtra, India International Journal of Scientific and Research Publications. 2012; 2(5):1-5.
11. Gary J. Martin. Ethnobotany – A method manual WWF International Champman and Hall, 1995.
12. Ekanayake ER, Nair BM. Proximate composition, mineral and amino acid content of mature *Canavalia gladiata* seeds, Food Chem. 1998; (66):115-19.
13. Grivetti LE, Ogle BM. Value of traditional foods in meeting macro- and micronutrient needs: the wild plant connection, Nutrition Research Reviews. 2000; 13:31-46.
14. Gunjatkar Nalini, Vartak VD. - Enumeration of wild edible legumes from Pune district, Maharashtra State, Journal of Economic and Taxonomic Botany, 1982; 3:1-9.
15. Holland DJ, Jenkins ACW, Kendall C, Ransom TPP. Dietary fiber, the evolution of the human diet and coronary heart disease. Nutr. Res. 1998; 18:210-18.
16. Jadhav VD, Mahadkar SD, Valvi SR. Documentation and ethnobotanical survey of wild edible plants from Kolhapur District, Recent Research in Science and Technology. 2011; 3(12):58-63.
17. Jain SK. (ed.) Glimpses of Indian Ethnobotany Oxford & IBH Publishing Co, New Delhi, 1981.

18. Jain SK. (ed.) A manual of ethnobotany Scientific Publication Jodhpur, 1987.
19. Kaur C, Kapoor HC. Antioxidants in fruits and vegetables-the millennium's health. *Inter J Food Sci. Technol.* 2001; 36:703-25.
20. Kumbhojkar MS, Vartak VD. Ethnobotanical studies on wild edible grapes from sacred groves in western Maharashtra, *Journal of Economic and Taxonomic Botany.* 1988; (12):257-263.
21. Lucena RFP, Albuquerque UP, Monteiro JM, Almeida CFCBR, Florentino ATN, Ferraz JSF, *et al.* Useful Plants of the Semi-Arid Northeastern Region of Brazil: A Look at Their Conservation and Sustainable Use. *Environmental Monitoring and Assessment.* 2007; 125:281-90.
22. Maikhuri RK, Rao KS, Saxena KG. Bioprospecting of wild edibles for rural development in the central Himalayan mountain of India. *Mt. Dev.* 2004; (24):110-13.
23. Tardi' OJ, Pardo-de-Santayana M. Cultural importance indices: a comparative analysis based on the useful wild plants of southern Cantabria (Northern Spain). *Econ Bot.* 2008; 62:24-39.
24. Manju Sundriyal, Sundriyal RC. Underutilized edible plants of the Sikkim Himalaya: Need for domestication, *Current Science.* 2003; 85(6):731-36.
25. Masuda T, Inaba Y, Maekawa T, Takeda Y, Yamaguchi H, Nakamoto K, *et al.* Simple detection method of powerful atiradical compounds in the raw extract of plants and its application of the identification of antiradical plant constituents, *J Agric. Food Chem.* 2003; 51:1831-38.
26. Muniyappan Dhanasekaran, Savarimuthu Ignacimuthu, Paul agastian. Potential hepatoprotective activity of ononitol monohydrate isolated from *Cassia tora* L. on carbon tetrachloride induced hepatotoxicity in wistar rats *Phytomedicine Volume.* 2009; 16(9):891-95
27. Nilegaonkar Smita, Vartak VD, Chitre RG. Nutritional evaluation of some wild food plants from Pune and neighbouring districts, Maharashtra State, *Journal of Economic and Taxonomic Botany.* 1985; 6(3):629.
28. Oak G, Kurve P, Kurve S, Pejaver M. Ethno-botanical studies of edible plants used by tribal women of Thane District, *Journal of Medicinal Plants Studies.* 2015; 3(2):90-94.
29. Patale CK, Nasare PN, Narkhede SD. Ethnobotanical studies on wild edible plants of Gond, Halba and Kawar tribes of Salekasa taluka, Gondia District, Maharashtra State, India, *International Research Journal of Pharmacy.* 2015; 6(8):512-18.
30. Sharma P, Mujumdar AM. Traditional knowledge on plants from Toranmal plateau of Maharashtra *Indian Journal of Traditional Knowledge.* 2003; 2(3):292-96.
31. Patil MV, Patil DA. Some more wild edible plants of Nasik District (Maharashtra), *Ancient Science of Life.* 2000; 19:(¾):102-04.
32. Pawar Shubhangi, Patil DA. Certain unconventional food plants of Jalgaon district (Maharashtra), *J Non-timber Forest Product.* 2000; 7(3/4):229-32.
33. Rajasab AH, Mamamda Isaq. Documentation on folk knowledge on wild edible plants of north Karnataka, *Indian journal Of Traditional Knowledge.* 2004; 3(4):419-29.
34. Rekha Sinha, Valeria Lakra. Edible weeds of tribals of Jharkhand, Orissa and West Bengal *IJTK.* 2007; 6(1):217-22.
35. Rajan S, Gokila M, Jency P, Brindha P, Sujatha RK. Antioxidant and phytochemical properties of *Aegle marmelos* fruit pulp *International Journal of Current Pharmaceutical Research.* 2011; 3(2):65-70.
36. Smitha Jayaram, Shylaja M. Dharmesh Assessment of antioxidant potentials of free and bound phenolics of *Hemidesmus indicus* (L) R. Br against oxidative damage *Pharmacognosy Res.* 2011; 3(4):225-31.
37. Palani S, Raja S, Karthi S, Selvi Archan, Senthil Kumar B. In vivo analysis of nephro & hepato protective effects and antioxidant activity of *Madhuca longifolia* against acetaminophen-induced toxicity & oxidative stress *Journal of Pharmacy Research.* 2010; 3(1):9-16.
38. Satpute SV. Documentation of Wild Vegetables: A Study Based on Warud Tehsil – Maharashtra, *International Journal of Informative & Futuristic Research.* 2015; 2(8):2663-70.
39. Bandyopadhyay S, Sobhan Kr Mukherjee. Wild edible plants of Koch Bihar district, West Bengal *Natural Product Radianc.* 2009; 8(1):64-72.
40. Jha SK. Wild plant – foods of the tribal of Bastar (Madhya Pradesh). 1963; 30(2):56-80.
41. Sundriyal M. Distribution, propagation and nutritive value of some wild edible plants in the Sikkim Himalaya, Ph D thesis submitted to Garhwal University, Srinagar (Garhwal), 1999.
42. Swapnaja Deshpande, Uday Pawar, Rajendra Kumbhar. Exploration and documentation of wild food plants from Satara district, Maharashtra (India) - *International Journal of Food Science and Nutrition.* 2019; 4(1):95-01.
43. The Useful Plants of Tambopata Peru: II. Additional Hypothesis Testing in Quantitative Ethnobotany. *Economic Botany.* 1993; 47:33-43.
44. Kanika Chaudhary, Savita Chaurasia. Neutraceutical properties of *moringa oleifera*: a review. *European journal of pharmaceutical and medical research.* 2017; 4(4):646-55.
45. Upadhye A, Kumbhojkar MS, Vartak VD. Observation on wild plants used in the rural area of the Kolhapur district. *Ancient Sci. Life.* 1986; 6(2):119-21.
46. Vartak VD, Kulkarni DK. Monsoon wild leafy vegetables from hilly regions of Pune and neighbouring districts, Maharashtra State, *Journal of Economic and Taxonomic Botany.* 1987; 11(2):331-35.
47. Vivek Kumar, Rao RR. Some interesting indigenous beverages among the tribals of Central India *Indian Journal of traditional Knowledge* 2007; 6(1):141-43.
48. Vijigiri D, Bembrekar SK. Traditional knowledge wild edible plants used in the Mahur taluka of Nanded District, Maharashtra, India, *Research Directions,* 2015, 2(9).
49. Naik VN. *Flora of Marathwada* Amurt Prakashan, Aurangabad, 1998, 1(2).
50. Almeida MR. *Flora of Maharashtra.* Vol. IVB. Acanthaceae to Ceratophyllaceae. Blatter Harbarium, St. Xaviers College, Mumbai, 2003.
51. Abhijit Dutta, Neeta Lal, Musarrat Naaz, Abhijeet Ghosh, Rupa Verma. Ethnological and Ethno-medicinal Importance of *Aegle marmelos* (L.) Corr (Bael) Among Indigenous People of India *American Journal of Ethnomedicine.* 2014; 1(5):290-312

52. Deshmukh SA, Gaikwad DK. A review of the taxonomy, ethnobotany, phytochemistry and pharmacology of *Basella alba* (Basellaceae) Journal of Applied Pharmaceutical Science. 2014; 4(01):153-65.
53. Meena AK, Uttam S, Niranjan AK, Yadav Brijendra Singh, Nagariya AK, Rao MM, *et al.* Cassia tora Linn: A review on its ethnobotany, phytochemical and pharmacological profile Journal of Pharmacy Research. 2010; 3(3):557-60.
54. Chintha Pradeepika, Selvakumar R, Sajad Un Nabi, Sajeev MS, Namrata A Giri Ethnopharmacology and toxicology of threatened tuberous plant genus *Ceropegia* sp. L. A review The Pharma Innovation Journal. 2018; 7(9):192-96.
55. Mariya Paul, RadhaA, Suresh Kumar D. On the High value Medicinal plant, *Coleus forskohlii* Briq. Hygeia. J D. Med. 2013; 5(1):64-73.
56. Sougata Ghosh, Vijay Singh Parihar, Piyush More, Dilip D Dhavale, Balu A Chopade. Phytochemistry and Therapeutic Potential of Medicinal Plant: *Dioscorea bulbifera* Medicinal chemistry. 2015 5(4):160-72.
57. Alka Mehta, Neeraj K Sethiya, Chetan Mehta, GB Shah Anti-arthritis activity of roots of *Hemidesmus indicus* R.Br. (Anantmul) in rats Asian Pacific Journal of Tropical Medicine, 2012, 130-35.
58. Neha Sahu, Awantika Singh, Sayyada Khatoon, Brijesh Kumar, Arya KR, Macro microscopic and LCMS markers for identification and authentication of herbal formulations of *Taraxacum officinale* and *Launaea procumbens*; Int. J Res. Pharm. Sci. 2017; 8(3):301-10.
59. Ram avatar sharma, aruna kumari. Phytochemistry, pharmacology and therapeutic application of *oxalis corniculata* linn. - a review International Journal of Pharmacy and Pharmaceutical Sciences. 2014; 6(3):6-12.
60. Premalatha B. *Semecarpus anacardium* Linn. Nuts- A boon in alternative medicine Indian journal of traditional Knowledge. 2000; 38:1177-82
61. Phillips O, Gentry AH. The Useful Plants of Tambopata, Peru: I. Statistical Hypothesis Tests with a New Quantitative Technique. Economic Botany. 1993; 47:15-32.
62. Rossato SC, Leitão-Filho HF, Begossi A. Ethnobotany of *Caíças* of the Atlantic Forest Coast (Brazil). Economic Botany. 1999; 53:387-395.
63. Perumal Siddhuraju, Arumugam Abirami, Gunasekaran Nagarani, Marimuthu Sangeethapriya. Antioxidant Capacity and Total Phenolic Content of Aqueous Acetone and Ethanol Extract of Edible Parts of *Moringa oleifera* and *Sesbania grandiflora* International Journal of Biological, Biomolecular, Agricultural, Food and Biotechnological Engineering. 2014; 8(9):1090-98.