

Potential of wild plants as food in West Jaintia Hills district of Meghalaya

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ABSTRACT

India is a country with a large ethnic society and has immense wealth due to which it is rich in biodiversity. Wild edible plants are giving more nourishment and nutrition. Wild plants from forest have medicinal value specially in treating the ailments like cuts, wounds, cough, pain, stomach problems, etc. It provides food and other life support commodities and it is very important for the survival of human beings and other organisms besides maintaining nature and protection to our environment. The study of indigenous knowledge and selection of natural commodities has an immense importance in fulfilling the nutrition and medicine subsistence. Therefore a study was initiated in West Jaintia Hills of Meghalaya to understand the resource utilization pattern. The study found that 147 species of plants belonging to 62 families were utilized by the local tribal people as commodities for food and medicinal subsistence. The plants belonging to the family Rosaceae were selected in the highest number as the commodity with 11 species. The majority of the species were wild and collected from the forest. Some of the species were consumed mostly as they contain high nutrition and medicinal property. This indigenous knowledge about the high nutritional and medicinal value further indicates for initiating scientific study as well as community-based biodiversity conservation.

Keywords: Wild edible plants, Jaintia Hills, medicinal plants; nutrition, indigenous knowledge, biodiversity conservation

INTRODUCTION

Human existence and culture have straightforwardly otherwise by implication been impacted by their immediate environment (Radhakrishnan et al., 1996; Ignacimuthu et al., 1998). The importance of ethnobotany stems from the varied economic uses of plants among the primitive human societies, which may be equally beneficial to modern man. The known and unknown worth of plants had already been conveyed to the world (Jain, 1981). Uses of wild edible plants have played an important role in human life, since time immemorial. Millions of people do not have enough food to meet their daily requirements and

are deficient in one or more nutrients (Ogle and Grivetti, 2000; FAO, 2004) and a similar situation is noticed in India with a 70% rural population with a rain-fed agriculture-dependent population. In India, most rural inhabitants rely on wild edible plants to satisfy their further food needs as they provide staple and supplement foods to rural communities.

Traditional food systems depend on and reflect biological diversity as they typically incorporate locally available foods of plant and animal origin, are high in species variety, and have rich nutrient sources (Kuhnlein and Receveur, 1996; Tontisirin *et al.*, 2002). In India, the leaves of a large number of wild and cultivated plants are used

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as vegetables. They have a very high protective food value and are very easy to grow (Chauhan *et al.*, 2014).

There are about 3000 eatable plant species known to man, with just 30 developed yields adding to over 90% of the world's calorie consumption, and just 120 harvests are monetarily significant on a public scale. It is estimated that in India about 800 species are consumed as wild edible plants over the country (Singh and Arora, 1978). Wild edible plants not only provide food quantity but also make a significant contribution to the population nutrition throughout the year (Grivetti and Ogle, 2000; Ogle, 2001; Ogle *et al.*, 2001; Ogle *et al.*, 2003). The nutritional value of wild plants is higher than several known common vegetables (Ogle and Grivetti, 2000; Sundriyal and Sundriyal, 2001).

India got second position on the planet close to China in vegetable creation. However, usually this is often abundant however the suggested demand of 300g/capita/day of vegetables for a diet. Although 175 major and minor vegetable crops are grown in India including 82 leafy vegetables, there is a challenge to achieve the target of 160 million tons of vegetables to fulfill the recommended requirement by 2020 (Rai *et al.*, 2004). The World Health Organization (WHO) recommends a daily intake of more than 400g of vegetables per person to protect against diet-related chronic diseases (WHO, 2003). Besides, wild edible plants are a rich resource of carbohydrates, oils, proteins, minerals, ascorbic acid, and the antioxidant phenols (Aberoumand and Deokule, 2009).

Green Leafy Vegetables (GLVs) occupy an important place among the food crops as these provide adequate amounts of vitamins and minerals for humans. Green leafy vegetables, particularly in wild and weedy species, are key elements of traditional diets, as they are accessible, locally gathered or cultivated, and have diversified sources of nutrients and phytochemicals (Ogle *et al.*, 2001; Tontisirin *et al.*, 2002; Tarwadi and Agte, 2003). Studies by Chauhan *et al.* (2014) conducted in Chhattisgarh revealed that the life and economy of the tribal and local people are inti-

mately connected with the natural vegetation. Leafy vegetables play a major role in the nutritional requirement of the tribal and local population in remote parts of the Chhattisgarh. Leafy vegetables not only provide food quantity but also make a significant contribution to the population's nutrition throughout the year.

The tribal normally collect seeds of local forest products and sell them to earn their livelihood. Also, the diversity of leafy vegetable species offer variety in family diet and contribute to household food security as well as increase dietary diversity. Further, it provides rural households with supplemental income opportunities through their sale in the markets (Chauhan *et al.*, 2014). Traditional Knowledge of wild food is largely transmitted through the participation of individual's helps future generations to obtain inexpensive food resources (Misra *et al.*, 2008). Wild edible plants not only provide food quantity but also make a significant contribution to the population's nutrition throughout the year (Ogle *et al.*, 2003). The nutritional value of wild plants is higher than several known common vegetables (Ogle and Grivetti, 2000; Sundriyal and Sundriyal, 2001).

Most of the tribal community depends on agriculture for their livelihood, especially in hilly areas. Scientists have recently realized the importance of such plants in the rural economy. In the areas having high plant diversity income from non-timber forest products (NTFP) can be the main sources of household income of rural communities.

Wild edible plants are giving more nourishment nutrition besides, the hybrid one. Hybrids are pest resistant and of large size but nutrients are less. So the wild edible plants that are available should be given importance as they can be meet the requirements of nutrients and hunger. Studies are available on medicinal plants used by tribal communities but less emphasis is given on wild edible plants. So, the present investigation is undertaken to study the potential of wild plants as food in Jowai, Meghalaya.

MATERIALS AND METHODS

Meghalaya 'the abode of clouds' is a treasure of nature with its richly varied and dense endemic, ex-

otic, and cultivated flora. This is due to the diverse topography, varied and abundant rainfall, and differential climate edaphic conditions within the different regions. The climate of Meghalaya is moderate but humid.

West Jaintia Hills District where this study was conducted is one of the 11 districts of Meghalaya with a total geographical area of 1693 km² (654 sq m) (Figure 1). It has its physiographical features almost similar to that of Khasi Hills. The only difference is that it has a comparably more flat topography with a mild gradient. The entire Jaintia Hills is richly endowed with natural resources and in the bygone days was endowed richly with natural resources and rich flora and fauna. With Jowai as its headquarters, the district is gradually fading away in terms of ecology and environment due to the large-scale denudation of forests for lumbering business purposes and human encroachment towards the habitat.

A questionnaire method was followed to conduct a survey targeting the local market, Anganwadi center/school, and household during 2018-19. For this, more than 40 years age group was

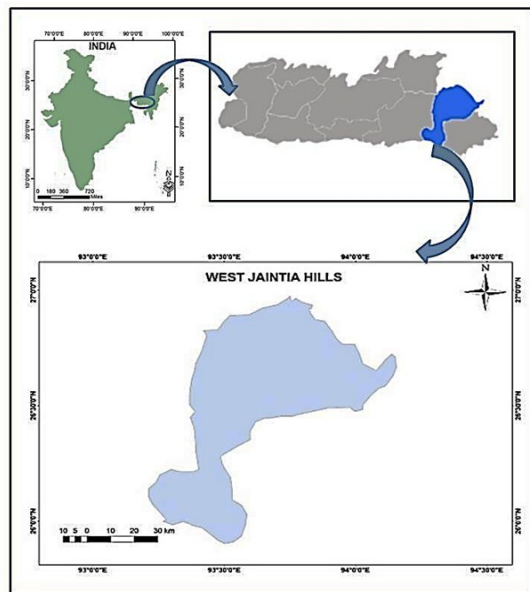


Figure 1. Map of Meghalaya showing the location of West Jaintia Hills district

selected as the respondents. Close-ended questions were designed in such a way that details information on the edible plants' selection and their part use, the purpose of use, harvesting time were ascertained. For identification of the wild edible plants, the Plant tissue Culture Laboratory, Silviculture Division of the Meghalaya Forest and Environment department assisted.

RESULTS

Selection of edible plants

A total of 147 species belonging to 62 families were recorded during the survey. The plants belonging to the family Rosaceae were selected in highest number as the commodity (11 species) followed by Moraceae and Rutaceae each with 10 numbers, Myrtaceae with 9 numbers, Euphorbiaceae with 8 numbers, Anacardiaceae with 7 numbers, Clusiaceae, Myrsinaceae, and Rubiaceae each with 6 numbers, Sterculiaceae and Tiliaceae each with 5 numbers, Sapindaceae and Piperaceae each with 4 numbers, Caesalpiniaceae with 3 numbers and Apiaceae, Arecaceae, Dilleniaceae, Elaeocarpaceae and Saurauiaceae while remaining 43 number of families represented by single number of species (Figure 2).

About 49.7% of the respondent stated that people preferred mostly the leaves of the wild plants. 27.7% of the respondent stated that fruits are preferred while 12.7% stated that tubers are their choice, 8.7% of them stated that endocarp is used and 1.2% stated that flowers are used (Figure 3).

Source and preference of edible plants

The wild plants are mostly collected from the forest as stated by 45.5% of the respondent. 31.6% of the respondent stated that they grow it in their gardens while 22.9% of the respondent favored both the choices (Figure 4).

Forty-five percent of the respondent stated that they used to purchase the wild edible plant while 4% stated that they use to collect it. However, 50.7% of the respondent stated that they purchase as well as they collect those wild plants (Figure 5).

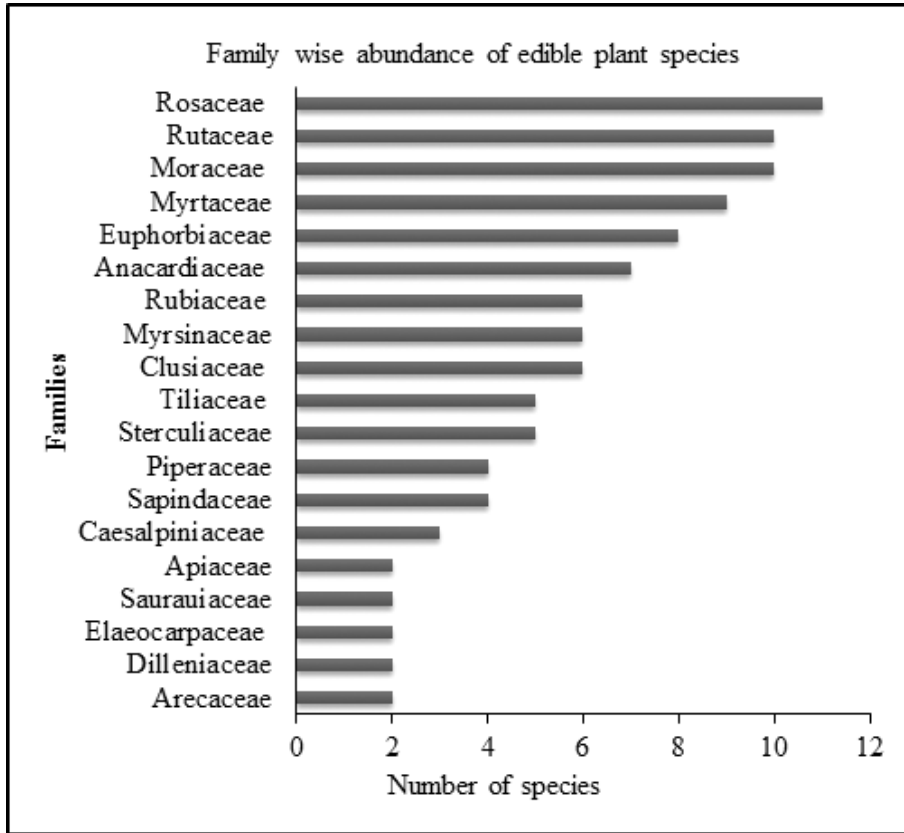


Figure 2. Families with some plant species selected as the food commodities

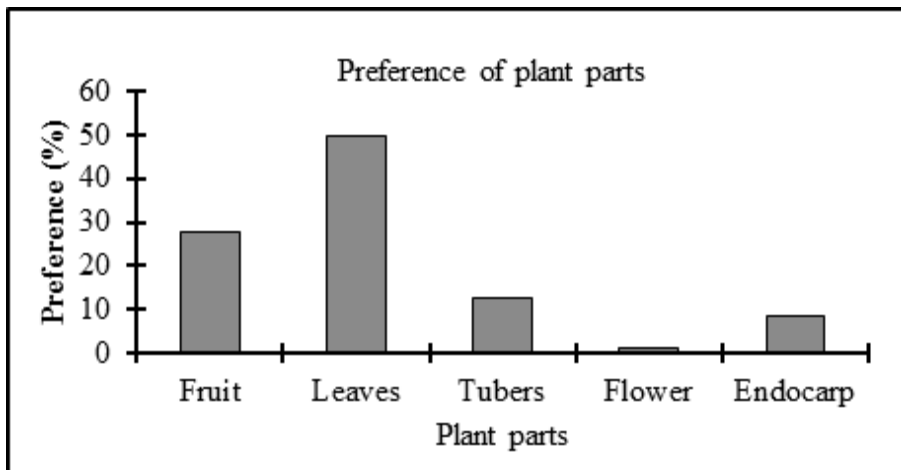


Figure 3. Preference of the wild edible plant parts in the study area

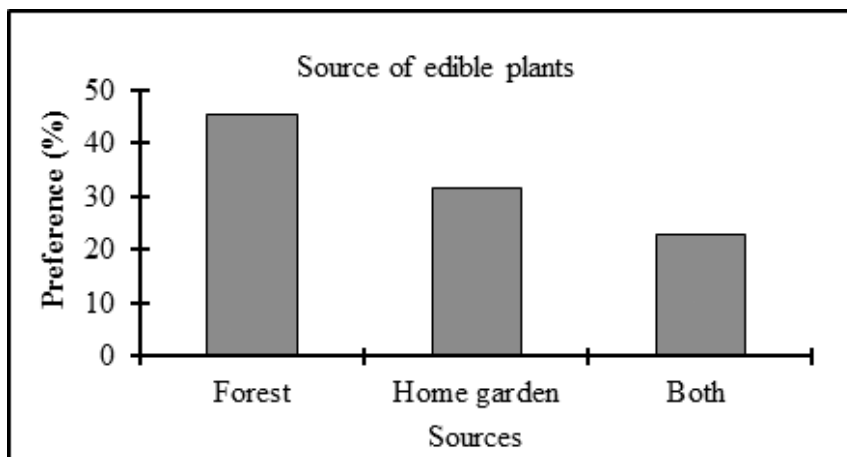


Figure 4. Collection of the wild edible plants



Figure 5. Mode of collection of wild edible plants

Seventy-four percent of the respondent stated that mostly wild variety of the plants are preferred, 21.5% of the respondent stated that cultivated variety are chosen while 4.7% of the respondent stated both of them are selected (Figure 6).

Cultivation of wild edible plant is done mostly in the study area (94.7%) whereas some preferred hybrid variety (1%) and some choose both (4.3%) (Figure 7).

Most of the wild edible plants in the study area are seasonally available (82%) while some are monthly available also (18%) (Figure 8).

Values of edible plants

Wild edible plants in the study area are mostly used for nutritional purposes (42.6%) followed by medicinal purposes (7.1%). 50.3% of the respondent stated that these plants are used for both the purpose (Figure 9, Appendix-1).

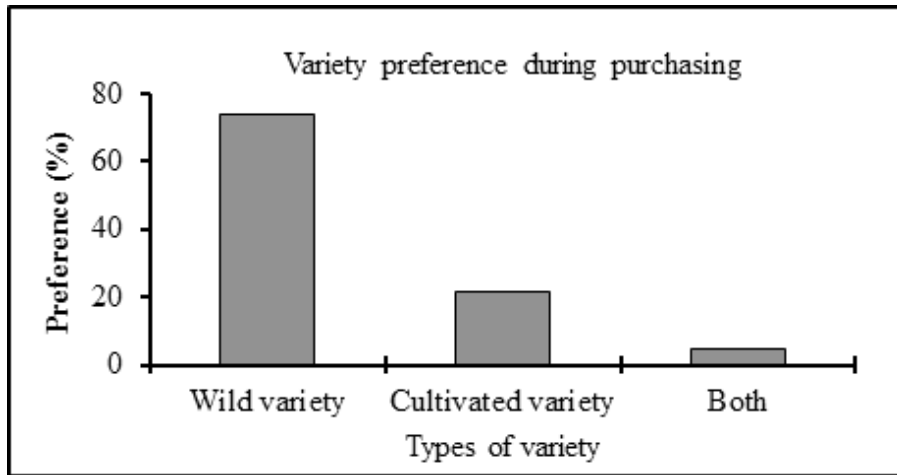


Figure 6. Peoples preference in variety selection during purchasing of wild edible plants

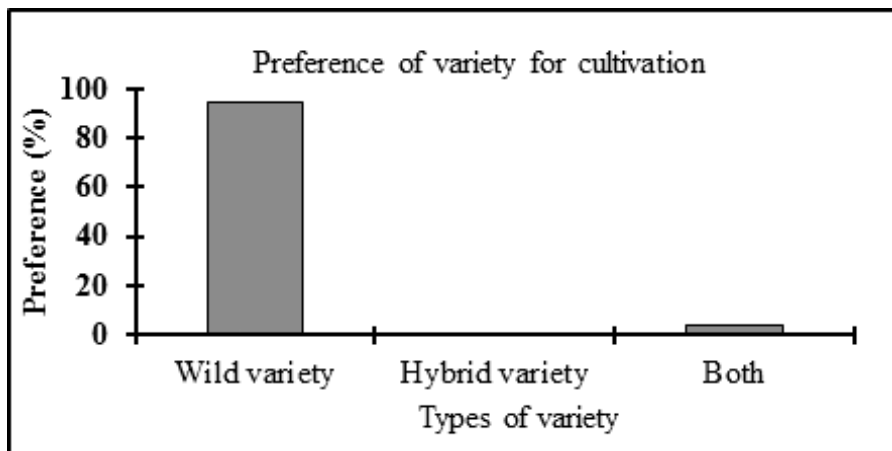


Figure 7. Variety selection of edible plants for cultivation

Conservation status

Among the identified wild edible plants, *Passiflora edulis* and *Citrus latipes* fall into the endangered category while *Cucurma aromatic*, *Ficus ariculata*, *Potentilla fulgens*, and *Acorus calamus*

in the vulnerable category. Interestingly, two species namely *Begonia palmate* and *Docynia indica* categorized as endemic species. So there is an urgent need for the conservation of these wild edible plants in this area (Table 1).

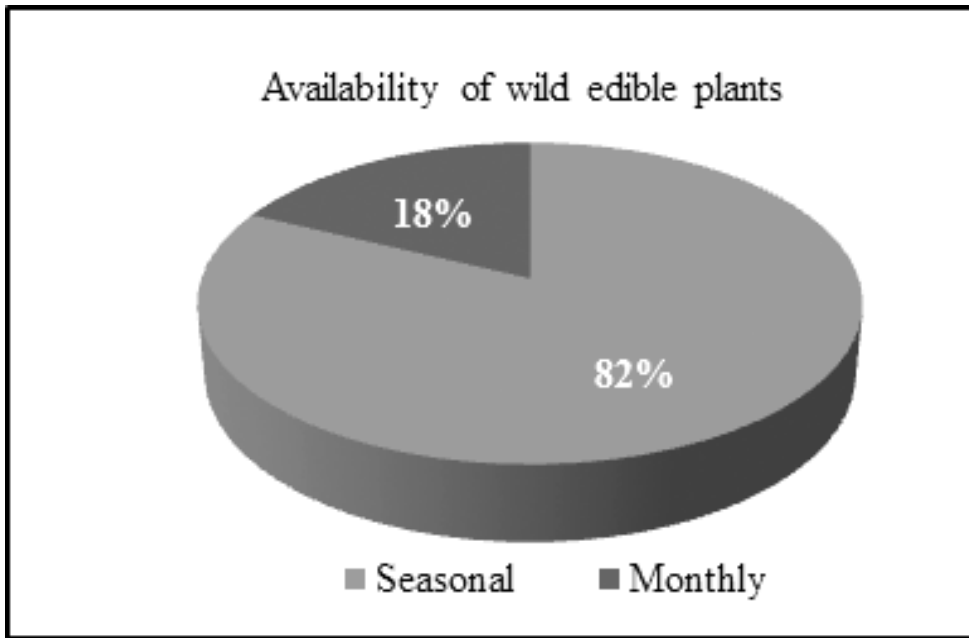


Figure 8. Availability of wild edible plants in the study area

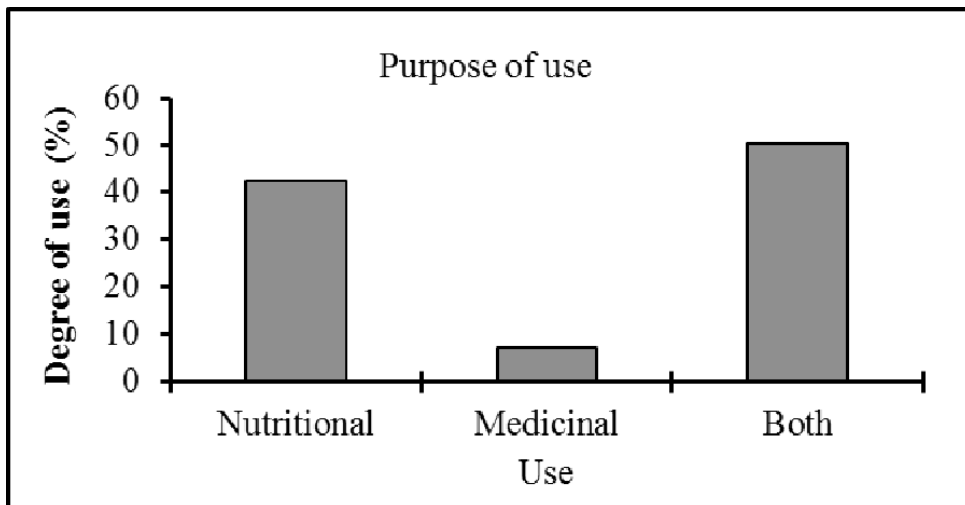


Figure 9. Uses of wild edible plants

Table 1. List of edible plants with their conservation status

Sl. No	Local name	Scientific name	Family	Conservation status
1	Sohbrab	<i>Passiflora edulis</i>	Passifloraceae	Endangered
2	Tyngkhieh	<i>Centella asiatica</i>	Apiaceae	Least concerned
3	Jamyrdoh	<i>Houttuynia cordata</i>	Saururaceae	Least concerned
4	Iajaw	<i>Begonia palmate</i>	Begoniaceae	Endemic
5	Dhania khloe	<i>Eryngium foetidum</i>	Apiaceae	Least concerned
6	Lachein	<i>Cucurma aromatica</i>	Zingiberaceae	Vulnerable
7	Soh-jaw	<i>Citrus latipes Tanaka</i>	Rutaceae	Endangered
8	Selishiat	<i>Ficus ariculata</i>	Moraceae	Vulnerable
9	Wathang	<i>Potentilla fulgens HK</i>	Rosaceae	Vulnerable
10	Iyew	<i>Acorus calamus</i>	Acoraceae	Vulnerable
11	Lapaiur	<i>Docynia indica</i>	Rosaceae	Endemic

DISCUSSION

Tropical forests are the major reservoir of plant diversity as they harbor about 50% of the total plant species identified so far, with 12% area of the earth. These forests inhabit a large number of trees, shrubs, herbs, climbers, epiphytes, faunal wealth, and a wealth of non-timber forest products (NTPF) including Medicinal and Aromatic plants (MAP) and wild edible plants. The wild edible plants with high diversity are widely distributed in mountain forests and are a valuable source of food and medicines for domestic and commercial purposes. Previous studies reported on the importance and contribution of some plants and NTFPs in local, forest-reliant livelihoods in some tropical developing countries (Malhotra *et al.*, 1991; Ganesan, 1993; Gunatilake *et al.*, 1993; Townson, 1995; Cavendish, 2000; Malik, 2000; Ambrose-Oji, 2003; Malla, 2003; Mahapatra *et al.*, 2005). In our study, the finding of 147 numbers of species further indicates the importance of the bioresource

of this region in the livelihood option of the local tribal people. The present study also recorded that *Houttuynia cordata* and *Centella asiatica* were the most preferred wild edible plants in this area. It is also found that the leaves of the wild edible plants are mostly used by them. The people used to purchase as well as collect the wild edible plants from both the forest and from their home garden. However, sustainable harvesting might help in both conservation and economic development of the rural people (FAO, 2001; Mahapatra *et al.*, 2005; Negi *et al.*, 2011; Heubes *et al.*, 2012; Shackleton *et al.*, 2011; Anglesen *et al.*, 2014).

People of this area use the wild edible plants both as food as well as for medicine. In the present study, *Passiflora edulis* and *Citrus latipes* are categorized as endangered species. On the other hand, *Begonia palmate* and *Docynia indica* are categorized as endemic species. So conservation of these plants needs more attention.

Selecting the preference of a few species is the cause of biodiversity loss. Besides, several

anthropogenic threats are there namely habitat loss and fragmentation for human settlement, developmental activities, and conversion of forest land into agricultural land (Talukdar *et al.*, 2019). However, an intermediate management system (Silva and Caballero, 2006) or agro-forestry combining both forest resources and semi-cultivated species must be implemented in the private land to check further loss of the forest. This may help maintain the biodiversity and complexity of the ecosystem (Michon *et al.*, 2007) and also relieve the poverty of this region.

The study concluded that wild plants have good potential of serving human beings as food material or as a substitute for crops. Therefore, there is a need to transfer the indigenous knowledge of wild plants to the subsequent generations for their sustainability. Similarly, the study also found that some of the plants need conservation measures due to excessive utilization failing which may lead to extinction of the species.

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REFERENCES

- Aberoumand A. and Deokule S.S. 2009. Studies on nutritional values of some wild edible plants from Iran and India. *Pakistan Journal of Nutrition* 8(1): 26-31.
- Ambrose-Oji B. 2003: The contribution of NTFPs to the livelihoods of the 'forest poor': evidence from the tropical forest zone of south-west.
- Anglesen A., Jagger P. and Babigumira R. 2014. Environmental in-come and rural livelihoods: a global-comparative analysis. *World Development*. <http://creativecommons.org/licenses/by-nc-nd/3.0/>.
- Cavendish W. 2000. Empirical regularities in the poverty–environment relationship of rural households: Evidence from Zimbabwe. *World Development* 28: 1979–2003.
- Chauhan D., Shrivastava A.K. and Patra S. 2014. Diversity of leafy vegetables used by tribal peoples of Chhattisgarh, India. *International Journal of Current Microbiology and Applied Science* 3(4): 611-622.
- FAO. 2001. How Forests Can Reduce Poverty. FAO, Rome. Food and Agricultural Organization of the United Nations (FAO).
2004. The state of food insecurity in the world, Monitoring the progress towards the world food summit 2nd millennium development goals. Annual report, Rome.
- Ganesan B. 1993. Extraction of Non-Timber forest products, including fodder and fuelwood, in Mudumalai, India. *Economic Botany* 47(3): 268-274.
- Grivetti, L.E. and Ogle, B.M. 2000. Value of traditional foods in meeting macro- and micronutrient needs: the wild plant connection. *Nutrition Research Reviews* 13: 31-46.
- Gunatilake H.M., Senaratne D.M.A.H. and Abeygunawardena P. 1993. Role of non-timber forest products in the economy of peripheral communities of Knuckles National Wilderness area of Sri Lanka: A farming system approach. *Economic Botany* 47(3): 275–281.
- Heubes J., Heubach K., Schmidt M., Wittig R., Zizka G., Nuppenau E. and Hahn K. 2012. Impact of future climate and land use change on non-timber forest product

- provision in Benin, West Africa: linking niche-based modeling with ecosystem service values. *Economic Botany* 66 (4), 383–397 .
- Ignacimuthu S., Sankaranarayanan K. and Kesavan L. 1998. Medico-ethnobotanical survey among Kanikar tribals of Mundanthurai Sanctuary. *Fitoterapia* 69: 409-414.
- Jain S.K. (Ed.) 1981. Glimpses of Indian Ethnobotany. Oxford and IBH Publishing Company, New Delhi.
- Kuhnlein H.V. and Receveur O. 1996. Dietary change and traditional food systems of indigenous peoples. *Annual Review of Nutrition* 16: 417-442.
- Mahapatra A., Albers H. and Robinson E. 2005. The impact of NTFP sales on rural households' cash income in India's dry deciduous forest. *Environmental Management* 35: 258–265 .
- Malhotra K.C., Deb D., Dutta M., Vasulu T.S., Yadav G. and Adhikari M. 1991. Role of Non Timber Forest Produce in Village Economy: A Household Survey in Jamboni Range . Mimeographed, Indian Institute of Biosocial Research and Development, Calcutta.
- Malik R.H. 2000. Sustainable management of non-timber forest products in Orissa: some issues and optics. *Indian Journal of Agricultural Economics* 55: 384–397.
- Malla Y.B., Neupane H.R., Branney P.J. 2003. Why aren't poor people benefiting more from community forestry. *Journal of Forest and Livelihood* 3(1): 78-92.
- Michon G., Foresta H., Levang P. and Verdeaux F. 2007. Domestic forests: a new paradigm for integrating local communities' forestry into tropical forest science. *Ecology and Society* 12(2): 1.
- Misra S., Maikhuri R.K., Kala C., Rao K. and Saxena K.G. 2008. Wild leafy vegetables: A study of their subsistence dietetic support to the inhabitants of Nanda Devi Biosphere Reserve, India. *Journal of Ethnobiology and Ethnomedicine* 4: 16.
- Negi V.S., Maikhuri R.K. and Rawat L.S. 2011. Non-timber forest products (NTFPs): a viable option for biodiversity conservation and livelihood enhancement in Central Himalaya. *Biodiversity Conservation* 20: 5450559.
- Ogle B.M. 2001. Wild vegetables and Micronutrient Nutrition - Studies on the Significance of Wild vegetables in Women's Diets in Vietnam, Comprehensive summaries of Uppsala, Dissertations from the Faculty of Medicine.
- Ogle B.M. and Grivetti L. 2000. Value of traditional foods in meeting macro and micronutrient needs: the wild plant connection. *Nutrition Research Reviews* 1331: 46.
- Ogle B.M., Ho T.T., Hoang N.D. and Nguyen N.X.D. 2003. Food, Feed or Medicine: The multiple functions of edible wild plants in Vietnam. *Economic Botany* 571: 103-117.
- Ogle B.M., Nguyen N.X.D., Do T.T. and Hambraeus, L. 2001. The contribution of Wild Vegetables to micronutrient intakes among women: An example from the Mekong Delta, Vietnam. *Ecology of Food and Nutrition* 40: 159-184.
- Radhakrishnan K., Pandurangan A.G., Pushpangadan P. and Sasidharan A. 1996. Less known ethnomedicinal plants of Kerala state and their conservation. *Ethnobotany* 8: 82-84.
- Rai M., Jagdish S. and Pandey A.K. 2004. Vegetables: A source of nutritional security, *Indian Horticulture* 48(4): 14-17.
- Shackleton S., Shackleton C., Shanley P. 2011. Non-Timber Forest Products in the Global Context. Springer, Berlin.
- Silva M.T.P. and Caballero J. 2006. The impact of shifting agriculture on the availability of

- non-timber forest products: the example of Sabalyapa in the Maya lowlands of Mexico. *Forest Ecology and Management*. doi: 10.1016/j.foreco.2005.10.043 .
- Singh H.B. and Arora R.K. 1978. Wild edible plants of India. First edition. ICAR Publication, New Delhi.
- Sundriyal M. and Sundriyal R.C. 2001. Wild edible plants of the Sikkim Himalaya: Nutritive values of selected species. *Economic Botany* 55(3): 377-390.
- Talukdar N.R., Choudhury P. and Barbhuiya R.A. 2019. The importance of trans-boundary conservation of the Asiatic elephant *Elephas maximus* in Patharia Hills Reserve Forest, northeastern India. *Journal of Threatened Taxa* 11(1): 13168–13170. doi: 10.11609/jott.4245.11.1.13168-13170.
- Tarwadi K. and Agte V. 2003. Potential of commonly consumed green leafy vegetables for their antioxidant capacity and its linkage with the micronutrient profile. *International Journal of Food Science and Nutrition* 54(6): 417-425.
- Tontisirin K., Nantel G. and Bhattacharjee L. 2002. Food-based strategies to meet the challenges of micronutrient malnutrition in the developing world. *Proceedings of the Nutrition Society* 61(2): 243-250.
- Townson I.M. 1995. Forest products and household incomes: a review and annotated bibliography. *Tropical Forestry Papers* 31. Oxford/Bogor, CIFOR/Oxford Forestry Institute.
- WHO (World Health Organization). 2003. Diet, nutrition and the prevention of chronic diseases. Report of a Joint FAO/WHO Expert Consultation, WHO Technical Report Series #916, Geneva.

Appendix-1: Plants used as medicine by the localities Body aches and colic

Species	Family	Habit	Parts used
<i>Begonia palmata</i>	Begoniaceae	Herb	Leaves
<i>Citrus latipes</i>	Rutaceae	Shrub	Fruit
<i>Docynia indica</i>	Rosaceae	Tree	Fruit
<i>Dysoxylum gobara</i>	Meliaceae	Tree	Leaves

Dermatological problems

Species	Family	Habit	Parts used
<i>Hedychium spp.</i>	Zingiberaceae	Herb	Rhizomes
<i>Vangueria spinosa</i>	Rubiaceae	Tree	Fruit
<i>Plantago erosa</i>	Plantaginaceae	Herb	Leaves
<i>Fagopyrum dibotrys</i>	Polygonaceae	Herb	Leaves

Gastro-intestinal disorder

Species	Family	Habit	Parts used
<i>Begonia palmata</i>	Begoniaceae	Herb	Leaves
<i>Centella asiatica</i>	Apiaceae	Herb	Leaves
<i>Drosera indica</i>	Droseraceae	Tree	Fruit
<i>Eriosema spp.</i>	Fabaceae	Herb	Leaves and fruits

Eye diseases

Species	Family	Habit	Parts used
<i>Begonia palmata</i>	Begoniaceae	Herb	Leaves
<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Leaves

Blood related problems

Species	Family	Habit	Parts used
<i>Centella asiatica</i>	Apiaceae	Herb	Leaves
<i>Dysoxylum gobara</i>	Meliaceae	Tree	Leaves
<i>Houttuynia cordata</i>	Saururaceae	Herb	Leaves