

MEDICO-BIOWEALTH OF INDIA

VOL. V



Edited by

SANJEET KUMAR

Medico-Biowealth of India

Vol.V

Edited by,

Sanjeet Kumar



Title: *Medico-Biowealth of India Vol. V / edited by Sanjeet Kumar*

Description: Includes bibliographical references

Subject: Medicinal Plants/ Ethnobotany/ Ethnopharmacology/ Plant Animal Interaction/
Biodiversity Conservation/ Restoration/ Population Biology/ Behaviour Biology

Published by:

APRF Publishers

Ambika Prasad Research Foundation

5A/561, CDA, Sector 9, Cuttack, Odisha

PIN- 753014, Odisha, India

Email-Id: sanjeet.biotech@gmail.com

www.aprf.co.in

Medico-Biowealth of India

Vol. V

First Edition: 2022

Copyright© Ambika Prasad Research Foundation

The content of this book is tried best to provide authenticated information. All the references necessary are listed. All attempts have been made to publish reliable information and acknowledge the copyright holders. If any copyright material(s) have not been acknowledged, please inform us, so we may rectify in our future reprints.

Price: Rs. 1850/-

Cover Page: *Geodorum densiflorum*

Back Page: Commander (*Moduza procris*)

Designed by: APRF, Odisha

ISBN: 978-81-952750-6-9

About the Editor

Dr. Sanjeet Kumar



He is the founder and CEO of Ambika Prasad Research Foundation, Odisha & Institute of Biological Sciences, Odisha. He has work experience in NBPGR, RPRC, RIE, DBT, NIT and Forest & Environment Department, Odisha. His research interest are plant taxonomy, medicinal plants, biodiversity and conservation, restoration of floral wealth, phytochemistry and microbiology. He has published about 120 research papers and 16 books. Currently he is working in Bonai Forest Division, Bonaigarh, Odisha and consulting in State Botanical Garden, Odisha.





**Shri Sudeep Nayak. IFS
Chief Executive Officer
State Medicinal Plants Board
(SMPB)**

I am happy to know that a book entitled "Medico-Bio Wealth of India" Vol-5 is going to be published by Mr. Sanjeet Kumar, Ambika Prasad Research Foundation, India.

Presently the biodiversity of the country is at stake. We are loosing many plants which have very high medicinal value. These plants need to be conserved to avoid extinction. This book will definitely provide wide range of information on the wealth of medicinal plant of the country.

I wish all success to Ambika Prasad Research Foundation for this noble couse.

A handwritten signature in black ink, appearing to read 'Sudeep Nayak', with a horizontal line extending to the right.

SUDEEP NAYAK, IFS
CHIEF EXECUTIVE
STATE MEDICINAL PLANT BOARD
ODISHA.

CONTENTS

Chapter	Title of the Chapter	Author(s)	Page Number(s)
Chapter -1	Edible and medicinal plants from sand dunes of eastern coastal areas	Ajay B Jadhao, Anjali Singh, Dawa Gyalpo, , Suman Malla, and Rajkumari Supriya Devi	1-10
Chapter-2	Common medicinal wetland herbs of Mahanadi river basin	Sugimani Marndi, Aroma Lyngdoh, Dalari Lyngdoh, Sudeesh PM, Sweta Mishra, Sinu Aradhana and Utkal Raj Dash Panigrahi	11-17
Chapter-3	Indigenous Traditional Knowledge (ITK) on wild edible fruits of Eastern Ghats, India	Sundar S Mety, Sonal Desai, Tambe Satish Sampatrao, Vandana Sharma and Sanjeet Kumar	18-24
Chapter-4	Medicinally important common orchids of India	Anushka Chakraborty, Nabendu Pal, Harsha Ashish Thanvi, Annapurna Dhal, Chandrima Debi*, Sanjeet Kumar* and Sweta Mishra	25-29
Chapter-5	Plants used in old age problems	Romita Devi, Dwaipayan Sinha*, Suchetana Mukherjee, Sanjeet Kumar and Sweta Mishra	30-44
Chapter-6	Importance of sacred groves in conservation of medicinal plants	Paramita Ray, Katake Rohit Dnvanoba. Pangare Pradnya Raiesh. Kumbharkar Akanksha Dattatray and Sanjeet Kumar	45-52
Chapter-7	Medicinally important terrestrial parasitic plants	Nidhi Mahendru, Melakau Masresha, Pallavi Joshi, Sugimani Marndi and Sanjeet Kumar	53-58

Chapter-8	Yams of India and their medicinal values	Kartik Chandra Guchhait, Gajender Singh, Soumi Sardar, Vidyanand Kumbhojkar, Sugimani Marndi and Sanjeet Kumar	59-62
Chapter-9	Medicinally important species of Fabaceae family of Loktak lake, India	Rajkumari Supriya Devi, Rakhee Dimri, Ramadevi Devarakonda, Vishnoo Omar and Sanjeet Kumar	62-66
Chapter-10	Preventive nutraceutical against coronavirus	Tikendrajit Baro, Pradip Kumar Patel, Rakhee Dimri, and Sanjeet Kumar	67-70

Edible and medicinal plants from sand dunes of eastern coastal areas

Ajay B Jadhao^{1*}, Anjali Singh², Dawa Gyalpo³, Suman Malla⁴, and Rajkumari Supriya Devi^{5*}

¹UG department of Botany, Arts & Science College, Pulgaon, Wardha, Maharashtra, India.

²Ambika Prasad Research Foundation, Odisha, India

³Chagpori Tibetan Medical Institute, Darjeeling, West Bengal, India

⁴Department of Forestry and Biodiversity, Tripura University, Agartala, Tripura, India

⁵Institute of Biological Sciences, Odisha, India

*Email-Id:cyrusajay@gmail.com; supriyark91@gmail.com

DOI: 10.5281/zenodo.6363827

ABSTRACT

Edible and wild medicinal plants are given utmost importance considering the food and medicine problems in the developing countries of the world. Documentation of wild food plants and therapeutic systems using medicinal plants is becoming very important as the current scenario for documentation of ethnobotany knowledge on therapeutic systems is diminishing in many parts of the world and there is a difference in the availability and use, availability of plants in different regions of the world. The diversity of ecological variation can create adaptability for the plants growing in that particular region. It is, therefore, necessary to document the knowledge of wild edible plants and medicinal plants of different regions, especially those that have a unique ecology. Keeping the importance of coastal ecology, an attempt has been made to enumerate the plants used as food and medicines from sand dunes of eastern coastal areas of Odisha, India. The present study reveals about 40 plants in coastal sand dune ecology that have food as well as medicinal values. This documentation of wild food and medicinal plants will be helpful for the future development of drugs.

Key words: Coastal sand dunes, edible wild plants, medicinal plants, nutraceuticals, drug development

INTRODUCTION

There is still an issue of food problems in many parts of developing countries in this advanced modern era. The rise in the population and poverty-stricken sections of the world normally face a lack of proper food and nutrition. Although the government has taken several initiatives to remove these problems, such problems still exist in reality. Sometimes, many such people do not get the medicines when needed. Researchers have been searching for an alternative to food and medicine to lessen the above-stated issues. Wild food and medicinal plants are not new to the world, and many indigenous people mostly aware of the wild food plants and medicines available locally. Yet, modern society does not readily accept and utilise such knowledge, and gradually, such precious knowledge of wild plants is diminishing (Chopra *et al.*, 1996; Rout *et al.*, 2009). There is a huge ocean of knowledge regarding the therapeutic systems of medicine using medicinal plants, especially in countries like India. Some of the wild indigenous plants can be both nutritional and medicinal. Such plants that serve the purpose of food with their nutrition as well as their medicinal values are known as nutraceuticals. Some of the wild food plants include *Neptunia oleracea*, *Ipomoea aquatica*, *Dillenia indica*, *Cassia tora*, *Dendrocalamus strictus*, etc. Some of the wild plants that are used as medicine include *Chlorophytum tuberosum*, *Eryngium foetida*, *Aegle marmelos*, *Rauwolfia serpentina*, etc. However, many wild plants possess a high nutritive value in addition to certain bioactive compounds that are responsible for being used against various diseases and disorders. Some of the wild nutraceuticals

include *Amorphophalus paeoniifolius*, *Eryngium foetida*, *houltuynia cordata*, *Dioscorea* spp., etc. Nutraceuticals play an important role as they have potential food and medicinal values and such plants could be an alternative source of food to meet the food problems in developing countries (Sabeela and Devi 2019). With regard to nutraceuticals, there are many potential plants to be nutraceuticals, which have already been found by the indigenous people of the particular region or by many tribal communities around the world. They are not yet explored by the scientific community to validate the therapeutic claims or nutritional values (Namukoba *et al.*, 2011; Kumar *et al.*, 2017; Sahu *et al.*, 2019). Therefore, there is a need to explore the food and medicinal values of a specific region, especially if it has a unique ecology. Coastal sand dunes have a unique ecology where the flora of the sand dunes grows well, binding the sand together and protecting it against erosion. The sand dune flora near the coastal belts also serves as wind breaks (Sahu *et al.*, 2019). Such salt tolerant flora with diverse ecological importance, due to its ability to withstand adverse conditions, could be a potential phytochemical source to be used against many diseases and disorders. The present study focuses on the exploration of ethnobotany with respect to food and medicine of the floral diversity on the sand dunes.

METHODOLOGY

A floral survey was carried out at the coastal sand dunes areas of Puri-Konark Marine Drive in Odisha during the different months of summer, winter, and rainy seasons of the years 2020-2021 along with literature survey on food & medicinal values of enumerated plants. During the survey, a passport data form (PDF) or a semi-structured questionnaire was prepared and also interviews were carried out regarding the uses of sand dunes flora by the local inhabitants of the study area. The interviews were carried out to people between the ages of 30 and 45 years old, regardless of their gender.

RESULTS AND DISCUSSION

The survey carried out for the important flora of coastal sand dunes and their uses revealed about 40 plant species to be used as food and medicine. Some of the important plants used as food include *Acanthus ilicifolius*, *Sesuvium portulacastrum*, *Salicornia brachiata*, *Anacardium occidentale*, *Borassus flabellifer*, *Cocus nucifera*, *Phoenix sylvestris*, *Ipomoea aquatica*, *Coccinia grandis*, *Canavalia maritima*, *Indigofera tinctoria*, *Vitex negundo*, *Abutilon indicum*, *Pandanus fascicularis*, *Pedaliium murex*, *Richardia scabra*, *Salvadora persica*, *Solanum violaceum*, and *Melochia corchorifolia*. Some of the important plants used as medicinal plants include *Terrestris tribulus*, *Achyranthes aspera*, *Aristolochia indica*, *Calotropis gigantea*, *Launaea sarmentosa*, *Ageratum conyzoides*, *Calophyllum inophyllum*, *Casuarina equisetifolia*, *Jatropha gossypifolia*, *Crotalaria retusa*, *Tephrosia purpurea*, *Zornia diphylla*, *Clerodendrum inerme* and *Spinifex littoreus*. The maximum flora used by the local inhabitants of the study area belongs to the families Fabaceae (6 spp.),

Table 1: Edible and medicinal sand dune plants in study areas

Botanical name	Family	Common name	Part used	Source(s)
<i>Abutilon indicum</i>	Malvaceae	Indian mallow	Leaves made into chutney; Tea prepared from roots helps to relieve from headache.	Present study
<i>Acanthus ilicifolius</i>	Acanthaceae	Sea holly	Rhizoid is edible; the Leaves extract is used for skin infection.	Velmani et al. (2016)
<i>Achyranthes aspera</i>	Amaranthaceae	Chaff flower	Crushed leaves is used in the treatment of boils.	Hasan (2014) ; Sharma et al. (2021)
<i>Ageratum conyzoides</i>	Asteraceae	Whiteweed	Leaves are used to treat inflammation & Wounds.	Rana et al. (2017) & Present study
<i>Anacardium occidentale</i>	Anacardiaceae	Cashew tree	Fruit is used as a food.	Iqbal et al. (2021)
<i>Aristolochia indica</i>	Aristolochiaceae	Duck weed	Fresh leaves are used to treat rheumatism.	Devesh and Alka (2014)
<i>Boerhavia diffusa</i>	Nyctaginaceae	Red hogweed	Leaves used as a green leafy vegetables.	Nandi and Ghosh (2016)
<i>Borassus flabellifer</i>	Areaceae	Palmyra tree	Fruit is used as a food.	Gummadi et al. (2016)
<i>Caesalpinia bonduc</i>	Fabaceae	Yellow nicker	Seed oil is used for cooking purposes.	Singh and Raghav (2012)
<i>Calophyllum inophyllum</i>	Calophyllaceae	Mastwood	Seed oil is used against wound healing.	Mishra et al. (2010)
<i>Calotropis gigantea</i>	Asclepiadaceae	Crown flower	Leaves are used against skin diseases.	Sarkar et al. (2014)
<i>Canavalia maritima</i>	Fabaceae	Bay bean	Seeds and young pods are used as vegetables.	Present study
<i>Casuarina equisetifolia</i>	Casuarinaceae	Coastal she-oak	Bark is used to treat diarrhoea.	Kumar (2016)
<i>Ceratopteris thalictroides</i>	Pteridaceae	Water sprite	The paste made from whole plant and mixed with turmeric is used to treat skin diseases.	Karthik et al. (2011) & Present study
<i>Clerodendrum inerme</i>	Lamiaceae	Glory bower	The crushed leaf is used externally for treating skin diseases.	Al-Snafi (2016)
<i>Coccinia grandis</i>	Cucurbitaceae	Ivy gourd	Fruit of this plant is edible.	Present study
<i>Cocos nucifera</i>	Areaceae	Coconut tree	Endosperm is edible.	Present study
<i>Crotalaria retusa</i>	Fabaceae		Leaves are used in fever.	Yaradua (2018)

<i>Hydrophylax maritima</i>	Rubiaceae	East-Indian water bluet	Roots and leaves are used to treat arthritis.	Deepak (2014)
<i>Indigofera tinctoria</i>	Fabaceae	Birdsville indigo	Seeds are eaten.	Present study
<i>Ipomoea aquatica</i>	Convolvulaceae	Water morning glory	Leaves is taken as vegetables.	Present study
<i>Ipomoea pes-caprae</i>	Convolvulaceae	Morning glory	Leaf is used to treat diabetes.	Gopukumar et al. (2013)
<i>Jatropha gossypifolia</i>	Euphorbiaceae	Bellyache bush	Leaf decoction is used for wounds.	Seth and Renu (2010)
<i>Launaea sermentosa</i>	Asteraceae	Beach launaea	The root is taken as a medicine by mothers after child birth.	Present study
<i>Melochia corchorifolia</i>	Sterculiaceae	Chocolate weed	Leaves and fruits are edible.	Present study
<i>Pandanus fascicularis</i>	Pandanaceae	Screw pine	Fruit of this plant is edible.	Present study
<i>Pedalium murex</i>	Pedaliaceae	Bora gokhru	All parts of the plant are edible.	Present study
<i>Phoenix sylvestris</i>	Areaceae	Indian date	Jams are prepared from the fruit.	Present study
<i>Richardia scabra</i>	Rubiaceae	Rough mexican clover	All parts of the plant are edible.	Present study
<i>Salicornia brachiata</i>	Amaranthaceae	Pickle weed	Leaves and young shoots are edible.	Present study
<i>Salvadora persica</i>	Salvadoraceae	Tooth brush tree	Leaves are used for making salad.	Present study
<i>Sesuvium portulacastrum</i>	Aizoaceae	Sea purslane	Young plants are edible.	Sahu et al. (2019)
<i>Solanum violaceum</i>	Solanaceae	Poison berry	Fruits are edible.	Present study
<i>Spinifex littoreus</i>	Poaceae	Littoral spinegrass	Root is used to treat joint pain.	Gokulnath et al. (2014)
<i>Suaeda maritima</i>	Amaranthaceae	Seep weeds	Leaves are edible and eaten as fresh vegetables.	Present study
<i>Tamarix troupii</i>	Tamaricaceae	Indian Tamarisk	Fruit and leaves is used to treat dysentery.	Sahu et al. (2019)
<i>Tephrosia purpurea</i>	Fabaceae	Wild indigo	Whole plant is used for the treatment of piles.	Deepak (2014)
<i>Tribulus terrestris</i>	Zygophyllaceae	Gokshura	Used against urinary infections.	Present study
<i>Vitex negundo</i>	Lamiaceae	Chaste tree	Leaves is used to avoid pest in storage of grains.	Present study
<i>Zornia diphylla</i>	Fabaceae	Two-leaf Zornia	Whole plant is used against diarrhoea.	Present study



Plate 1:Some common sand dune plants; a. *Caesalpinia bonduc*; b. *Ipomoea biloba*; c. *Tephrosia pupurea*; d. *Aristolochia indica*; e. *Ceratopteris thalictroides*; f. *Pedalium murex*; g. *Spinifex littoreus*; h. *Hydrophylax maritima*



Plate 2: a. *Tribulus terrestris*; b. *Abutilon indicum*; c. *Acanthus ilicifolius*; d. *Ageratum conyzoides*; e. *Anacardium occidentale*; f. *Boerhavia diffusa*; g. *Calophyllum inophyllum*; h. *Calotropis gigantea*

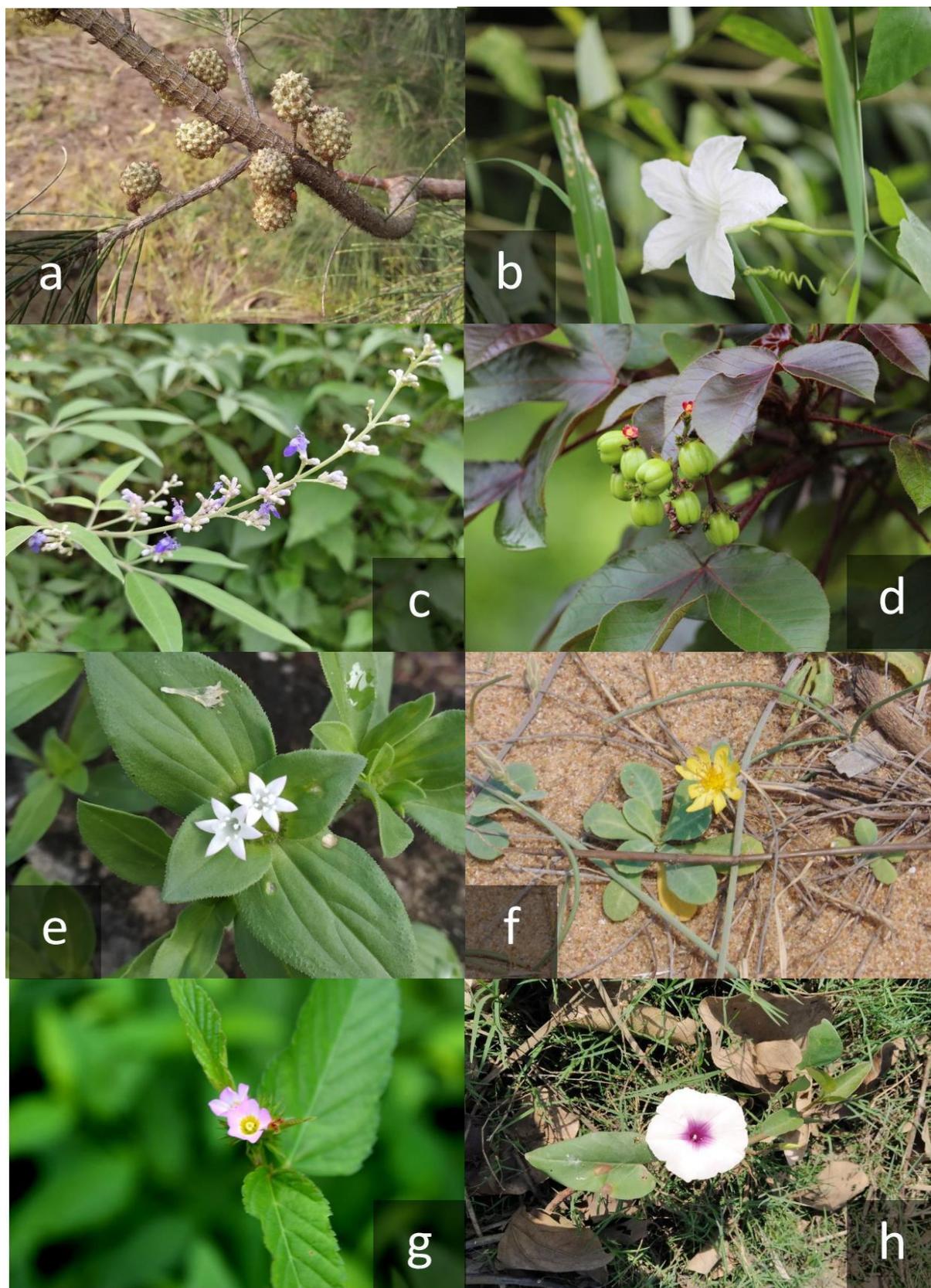


Plate 3: a. *Casuarina equisetifolia*; b. *Coccinia grandis*; c. *Vitex negundo*; d. *Jatropha gossypifolia*; e. *Richardia scabra*; f. *Launaea sarmentosa*; g. *Melochia corchorifolia*; h. *Ipomoea aquatica*



Plate 4: Floral survey activities of sand dune flora

Amaranthaceae (3 spp.), Arecaceae (3 spp.), etc. However, plants that belong to families like Acanthaceae, Aizoaceae, Aristolochiaceae, Asclepiadiaceae, Calophyllaceae, Casuarinaceae, Cucurbitaceae, Euphorbiaceae, Malvaceae, Nyctaginaceae, Pandanaceae, Pedaliaceae, Pteridaceae, Salvadoraceae, Solanaceae, Sterculiaceae, and Tamaricaceae show the least species used as food and medicine. *Acanthus ilicifolius* is found to be used against skin infection. The crushed leaves of *Achyranthes aspera* is used for the treatment of Boils. Again, the root of *Launaea sermentosa* is used post-childbirth for faster recovery. *Zornia diphylla* is used to treat diarrhoea. Gokulnath and co-workers earlier in 2014 described the use of *Spinifex littoreus* for the treatment of joint pain. Many plants, including *Anacardium occidentale*, *Boerhavia diffusa*, *Borassus flabellifer*, *Canavalia maritima*, *Coccinia grandis*, *Cocos nucifera*, *Melochia corchorifolia*, *Pandanus fascicularis*, *Pedaliium murex*, *Phoenix Sylvestris*, *Richardia scabra*, *Salicornia brachiata*, *Salvadora persica*, *Solanum violaceum*, and *Suaeda maritima*, have been used as food. The present study as well as the earlier study suggest that some of the sand dune flora are found to be potential medicinal plants. More and deeper analysis of the bioactive compounds of these potential medicinal plants needs to be explored for the screening of new drug development.

CONCLUSION

The present study showed that different wild plants were used as food and medicinal value from sand dunes of eastern coastal areas of Puri-Konark Marine Drive in Odisha state. Different part such as leaves, stem, rhizoids, fruits and seed

used as food as well as to cure common medicinal problems. Basically 40 different plants species were collected from various sites along with their medicinal property. All these species have different medicinal potential to cure various types ailments. These edible plants provide food and nutrition such as essential amino acids, vitamins, and minerals for this community to stay healthy. But due to globalization and modernization traditional knowledge become vanished. Therefore, it is vital to document and preserve rich traditional knowledge for future generations, as well as to conserve and harness useful wild edible plants for future prospects.

REFERENCES

- Al-Snaf AE. Chemical Constituents and Pharmacological Effects of *Clerodendrum inerme*- A Review. *SMU Medical Journal*. 2016; 3(1): 129-152.
- Chakraborty T, Mondal AK, Parui S. Studies on the phytoresources of coastal dune flora at west Bengal and adjacent Odisha, India. *International Journal of Science and Nature* 2012; 3(4):572-579.
- Chopra RN, Nayar SL, Chopra IR (1996). *Glossary of Indian Medicinal Plants*. New Delhi: (Reprn. Edn.) National Institute of Science Communication. CSIR.
- Deepak SV. Prominent ethnobotanical coastal sand dune (CSD). *Coast track*. 2014; 13(1&2): 9-11.
- Devesh B and Alka C. Phytochemical investigation of *Aristolochia indica* L. An Ethno-medicine on Snake Bite. *International Journal of Life Sciences*. 2014: 172-174.
- Gokulnath M, Yuvaraj D, Gayathri PK, Chandran M, Vivek P, Kesavan D. Phytochemical Screening And Anti-Bacterial Studies In Salt Marsh Plant Extracts (*Spinifex littoreus* (BURM.F) MERR. and *Heliotropium curassavicum* L.). *International Journal of Chem Tech Research*. 2014; 6(9): 4307-4311
- Gopukumar ST, Ariharan VN, Sharmila ST. Biochemical profile and potential medicinal use of *Ipomoea biloba* present in western coastal line of Arabian Sea at south India. 2013; 1(1): 136-139.
- Gummadi VP, Battu GR, Divya K, Manda K. A review on Palmyra palm (*Borassus flabellifer*). *International Journal of Current Pharmaceutical Review and Research*. 2016; 8(2): 17-20.
- Hasan S. Pharmacological and medicinal uses of *Achyranthes aspera*. *International Journal of Science and Environment* 2014; 3(1): 123-129.
- Iqbal Z, Akram M, Saeed MM, Ahsan M, Daniyal M, Sharif A. Medicinal Uses of Cashew (*Anacardium occidentale*): Review. *Journal of Science Technology and Research*. 2021; 2(1): 1-9.
- Jain A, Katewa SS, Galav P, Sharma P. Medicinal plant diversity of Sitamata wildlife sanctuary, Rajasthan, India. *Journal of Ethnopharmacology* 2005; 102:143-157.
- Karthik V, Raju K, Ayyanar M, Gowrishankar K, Sekar T. Ethnomedicinal Uses of Pteridophytes in Kolli Hills, Eastern Ghats of Tamil Nadu, India. *Journal of Natural Products Plant Resour*. 2011; 1(2): 50-55.
- Kirtikar KR and Basu BD (1991). *Indian Medicinal Plants*. 4 Vols. (Reprn. Edn). Allahabad: Lalit Mohan Basu Publications.
- Kumar S, Das G, Shin HS and Patra JK. (2017). *Dioscorea* spp. (A Wild edible tuber): A study on its ethnopharmacological potential and traditional use by the local people of Similipal Biosphere Reserve, India. *Frontiers in Pharmacology*. 8(52): 1-17.
- Kumar V. *Casuarina equisetifolia* L.: A potential tree. *International Journal of Agriculture and Biology*. 2016; 3(9): 14-17.
- Mishra US, Murthy PN, Choudhury PK, Panigrahi G, Mohapatra S, Pradhan D. Antibacterial and Analgesic Effects of the Stem Barks of *Calophyllum inophyllum*. 2010; 2(2): 973-979.
- Namukobe J, Kasenene JM, Kiremire BT, Byamukama R, Mugisha MK, Krief S, Dumontet V and Kabasa JD. (2011). Traditional plants used for medicinal purposes by local communities around the Northern sector of Kibale National Park, Uganda. *Journal of Ethnopharmacology*. 136: 236-245.

- Nandi R and Ghosh R. Phytochemical and Biological Importance of *Boerhavia diffusa*: A Plant of Ethnopharmacological knowledge. International Journal of Pharma Sciences and Research. 2016; 7(3): 134-143.
- Rana S, Prakash V, Sagar A. Studies on antibacterial and antioxidant activity of *Ageratum conyzoids* linn. International Journal of Science and Nature. 2017; 8(1): 59-63.
- Rout SD, Panda T and Mishra N. (2009). Ethno-medicinal plants used to cure different diseases by Tribals of Mayurbhanj District of North Orissa. 3(1): 27-32.
- Sabeela BU and Devi RS. (2019). *Lasia spinosa*: Wild Nutraceutical for formulation of future drugs. Ethnopharmacology and Biodiversity of Medicinal Plants. APPLE ACADEMIC PRESS.
- Sahu L, Devi SR, Kumar S. Coastal sand dune flora of Odisha: Source for drug formulations against antimicrobial Resistance. Journal of Biodiversity and Conservation. 2019; 3(1): 217-228
- Sarkar S, Chakraverty R, Ghosh A. *Calotropis Gigantea* Linn. - A Complete Basket Of Indian Traditional Medicine. International Journal of Pharmacy Research. 2014; 02(1): 7-17.
- Seth R and Sarin R. Analysis of the phytochemical content and anti- microbial activity of *Jatropha gossypifolia* L. Archives of applied science research. 2010; 2(5): 285-291.
- Sharma R, Singh G. *Achyranthes aspera*: An assessment of medical validation for its dietary and phyto- pharmacological potentials. Journal of Emerging Technologies and Innovative Research. 2021; 8(4): 1270- 1280.
- Singh V, Raghav PK. Review on pharmacological properties of *Caesalpinia bonduc* L. Int. J. Med. Arom. Plants. 2012; 2(3): 514-530.
- Velmani S, Perumal B, Santhosh C, Vetrivel C, A. Maruthupandian A. Phytochemical and Traditional uses on *Acanthus ilicifolius* (L). Journal of Advanced Applied Scientific Research. 2016; 43-48.
- Yaradua SS. A review of the genus *Crotalaria* L. (Crotalarieae, Fabaceae). International Journal of Scientific and Research Publications. 2018; 8(6): 316-321.
- Zhu W, Du Y, Meng H, Dong Y, li l. A review of traditional pharmacological uses, phytochemistry and pharmacological activities of *Tribulus terrestris*. 2017; 11:60.

Common medicinal wetland herbs of Mahanadi river basin

Sugimani Marndi^{1*}, Aroma Lyngdoh², Dalari Lyngdoh², Sudeesh PM¹, Sweta Mishra¹, Sinu Aradhana¹ and Utkal Raj Dash Panigrahi¹

¹Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

²Department of Botany, Shillong College, Shillong, Meghalaya, India

*Email-Id: sugimani2marndi@gmail.com

DOI: 0.5281/zenodo.6363837

ABSTRACT

Mahanadi delta regions are the home of diverse aquatic flora. These plants have been widely used in traditional medicine with a long Indian history. This paper explores on wetland herbs of Mahanadi River basin which are used to cure various diseases and disorders. Forty five herbs species belonging to 29 families are being presented in this paper along with their medicinal uses. Some common medicinal herbs found in Mahanadi river basin are *Alternanthera sessilis*, *Persicaria glabra*, *Limnophyton obtusifolium*, *Centella asiatica* etc and used for treating numbers of health problems. Thus further studies are needed to enumerate the medicinal herbs in Mahanadi river basin along with conservation strategies.

Keywords: Mahanadi, Aquatic herb, Odisha, Medicinal values

INTRODUCTION

The total geographical area of Odisha is divided into eleven river basins which drain directly into the Bay of Bengal. Among these river basins, Mahanadi river basin is one of the major estuaries in India and the largest estuary in Odisha (Dixit *et al.*, 2013). It originates in Dhamtari district of Chhattisgarh and spreads over about 900kms in different corners of Odisha (Mitra and Venkateswarlu 1998). It constitutes a huge biologically diverse wetlands ecosystems which provide livelihoods for the millions of people who live within and around it (Swapna *et al.*, 2011; Marndi *et al.*, 2020). Aquatic flora is an essential part of a river as well as all natural aquatic system. It fulfils a wide range of ecological roles, and makes a substantial contribution to the structure, function and service provision of aquatic ecosystems (Datta 2009; O'Hare *et al.*, 2018). Mahanadi delta regions are the home to diverse macro and micro flora. The dominate plant species are Sal (*Shorea robusta*), Asan (*Terminalia tomentosa*), Jamun (*Syzygium cumini*), Amla (*Phyllanthus emblica*), Bahada (*Terminalia bellirica*), Arjuna (*Terminalia arjuna*), Palas (*Butea monosperma*), Neem (*Azadirachta indica*), Oau (*Dillenia indica*), Sisoo (*Dalbergia sissoo*), Sunari (*Cassia fistula*), Bamboos and many shrub like *Ocimum*, *Plumbago zeylanica*, *Ziziphus* spp., Climbers like *Dioscorea* species, *Mucuna* species, herbs like *Alternanthera sessilis*, *Persicaria glabra*, *Limnophyton obtusifolium*, *Centella asiatica* etc along with diverse bryophytes and pteridophytes (Kumar *et al.*, 2018). From earlier days these plants played fascinating role in the life of human beings as food, fodder, medicine etc. The present investigation was formulated to study wetland herbs of Mahanadi river basin used as medicines by the incorporation of traditional knowledge of local communities.

METHODOLOGY

The Mahanadi River delta plain covers 0.9 x 10 km and extends between 80° 28' to 86° 43' E and 19° 8' to 23° 32' N. The catchment area of the river covers 1.42 x 10 km (Kumar *et al.*, 2018). Field trips were conducted from 2019 to 2021, from different communities living in the vicinities of Mahanadi River to collect data regarding various uses of wetland herbs and their medicinal values (Plate 2) in Odisha state. Traditional medicine practitioners/healers and local villagers were also interviewed to know the medicinal importance of the plants. The vernacular name, parts used, was recorded as per information gathered from the local traditional healers. The recorded plants are arranged in alphabetical order by their botanical names along with their families and uses.

RESULTS AND DISCUSSION

The results revealed that about 45 common medicinal wetland herbs are enumerated from Mahanadi river basin belonging to 29 families. It was noted that enumerated species belongs to 39 genus. The most frequent families are Asteraceae (5 species), Linderniaceae (5 species), Malvaceae (3 species), Euphorbiaceae (2 species), Rubiaceae (2 species), Hydrocharitaceae (2 species), Plantaginaceae (2 species), Pontederiaceae (2 species) and rest of the families Amaranthaceae, Tiliaceae, Zygophyllaceae, Solanaceae, Verbenaceae, Caryophyllaceae, Portulacaceae, Commelinaceae, Nymphaeaceae, Oxalidaceae, Fabaceae, Mazaceae, Marsiliaceae, Alismataceae, Poaceae, Boraginaceae, Convulvulaceae, Gentianaceae, Apiaceae, Cleomaceae are represented with single plant species. From enumerated species maximum plant are used in wound healing like *Cleome viscosa*, *Heliotropium indicum*, *Lindernia anagallis*, *Mecardonia procumbens*, *Murdannia spirata*, *Triumfetta pentandra*, in skin diseases like *Croton bonplandianus*, *Enhydra fluctuans*, *Oxalis corniculata*, and in asthma like *Alternanthera sessilis*, *Persicaria hydropiper*, *Sida cordifolia* (Table 1). These traditional methods of treatment based on medicinal plants are still an important part of local communities. Nevertheless, very few studies are carried out on floral diversity of Mahanadi river basin and their traditional therapeutic systems.

Table 1: Some common medicinal aquatic herb of Mahanadi river basin

Scientific name	Family	Medicinal uses	Part(s) used	Mode of uses
<i>Acmella oleracea</i>	Asteraceae	Toothache	Stem	Paste
<i>Alternanthera sessilis</i>	Amaranthaceae	Asthma	Leaves	Juice
<i>Bacopa monnieri</i>	Plantaginaceae	Memory disorder	Whole plants	Leafy vegetables
<i>Bonnaya antipoda</i>	Linderniaceae	Diarrhoea	Whole plant	Leafy vegetable
<i>Canscora diffusa</i>	Gentianaceae	Epilepsy	Whole plant	Juice

<i>Centella asiatica</i>	Apiaceae	Immune diseases	Whole plant	Juice
<i>Cleome viscosa</i>	Cleomaceae	Wound	Root	Paste
<i>Croton bonplandianus</i>	Euphorbiaceae	Skin diseases	Root	Paste
<i>Dentella repens</i>	Rubiaceae	Constipation	Tender leaf	Decoction
<i>Eclipta prostrata</i>	Asteraceae	Hair fall & dandruff	Whole plant	Paste
<i>Enhydra fluctuans</i>	Asteraceae	Skin diseases	Whole plant	Paste with seed oil of <i>Pongamia pinnata</i>
<i>Eriocaulon quinqueangulare</i>	Eriocaulaceae	Liver disease	Flower	Decoction with <i>Boerhavia diffusa</i>
<i>Euphorbia hirta</i>	Euphorbiaceae	Jaundice	Whole plant	Juice
<i>Evolvulus alsinoides</i>	Convolvulaceae	Hair fall	Whole plant	Paste
<i>Grangea maderaspatana</i>	Asteraceae	Piles	Root	Paste
<i>Hedyotis diffusa</i>	Rubiaceae	Cough	Leaf	Decoction with honey
<i>Heliotropium indicum</i>	Boraginaceae	Wound & ulcer	Leaf	Paste
<i>Hydrilla verticillata</i>	Hydrocharitaceae	Gastrointestinal disorder	Leaf	Leaf powder is mixed with <i>Allium cepa</i> and make paste. Paste is consumed raw.
<i>Hygroryza aristata</i>	Poaceae	Diarrhoea	Leaf	Juice
<i>Limnophyton obtusifolium</i>	Alismataceae	Epilepsy	Root	Juice
<i>Lindernia anagallis</i>	Linderniaceae	Wound	Whole plants	Paste
<i>Lindernia ciliata</i>	Linderniaceae	Menorrhagia	Whole plant	Juice
<i>Lindernia crustacea</i>	Linderniaceae	Dysentery	Whole plant	Juice
<i>Lindernia procumbens</i>	Linderniaceae	Boils & sores	Whole plant	Paste

<i>Marsilea minuta</i>	Marsiliaceae	Sleeping disorder	Leaf	As a leafy vegetable
<i>Mazus pumilus</i>	Mazaceae	Typhoid	Whole plant	Juice
<i>Mecardonia procumbens</i>	Plantaginaceae	Wounds	Root	Paste
<i>Mimosa pudica</i>	Fabaceae	Dysentery	Root	Juice
<i>Monochoria hastata</i>	Pontederiaceae	Boils	Root	Paste
<i>Monochoria vaginalis</i>	Pontederiaceae	Liver problems	Flower	Juice
<i>Murdannia spirata</i>	Commelinaceae	Wounds	Root	Paste
<i>Nymphaea pubescens</i>	Nymphaeaceae	Jaundice	Stem	Juice
<i>Oxalis corniculata</i>	Oxalidaceae	Skin diseases	Whole plant	Leafy vegetable
<i>Persicaria glabra</i>	Polygonaceae	Scabies	Root	Paste
<i>Persicaria hydropiper</i>	Polygonaceae	Asthma	Leaves	Leafy vegetable
<i>Phyla nodiflora</i>	Verbenaceae	Joint pain	Root	Paste
<i>Polycarpon prostratum</i>	Caryophyllaceae	Cough	Whole plant	Decoction
<i>Portulaca oleracea</i>	Portulacaceae	Tonic	Whole plant	Leafy vegetable and juice
<i>Sida acuta</i>	Malvaceae	Muscle pain	Whole plant	Powder mixed with mustard oil
<i>Sida cordifolia</i>	Malvaceae	Asthma	Leaf	Inhalation
<i>Solanum virginianum</i>	Solanaceae	Chest pain	Root	Paste
<i>Sphaeranthus indicus</i>	Asteraceae	Fever	Whole plant	Decoction
<i>Tribulus terrestris</i>	Zygophyllaceae	Urine infection	Whole plant	Decoction
<i>Triumfetta pentandra</i>	Tiliaceae	Sores & wounds	Root	Paste
<i>Vallisneria natans</i>	Hydrocharitaceae	Stomach-ache	Dried leaf	Dried leaf powder mixed with black pepper and honey.

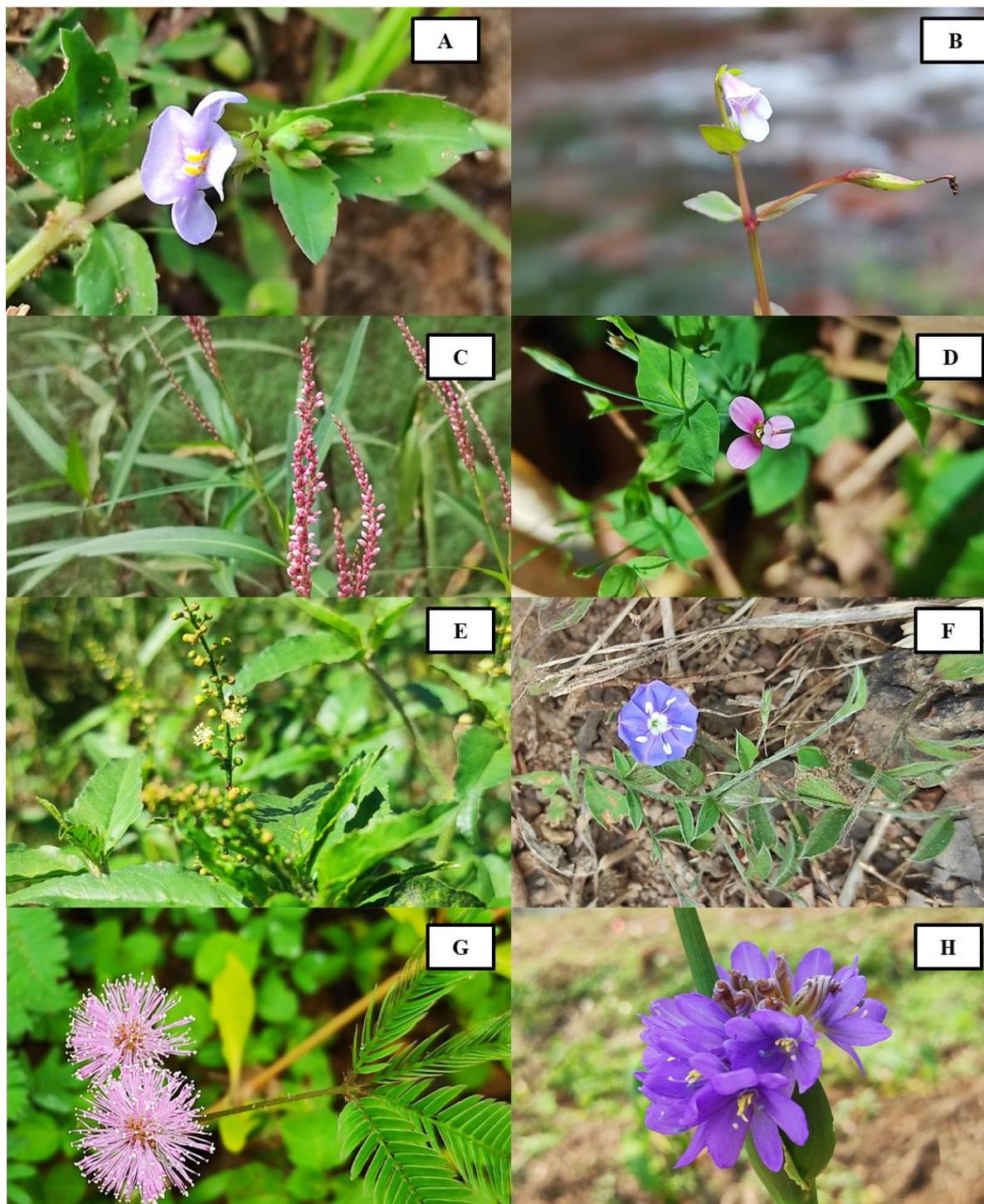


Plate 1: Some of the common medicinal aquatic herb of Mahanadi river basin A) *Bonnaya antipoda*, B) *Lindernia anagallis*, C) *Persicaria glabra*, D) *Canscora diffusa*, E) *Croton bonplandianus*, F) *Evolvulus alsinoides*, G) *Mimosa pudica*, H) *Monochoria hastata*

Some other researchers have also reported some medicinal plants related to Mahanadi river areas. In 1992, Subudhi et al., reported plants in Mahanadi delta having medicinal values. In 2003, Nayak et al., reported 30 plants having medicinal values comes under weeds of Mahanadi delta. The above works showed that less exploration works have done on wetland medicinal plants of the areas.

CONCLUSION

From phyto-diversity point of view, many wetland plants of Mahanadi River basin still remain unexplored. It is concluded that the quantitative and qualitative floristic survey with their traditional therapeutic systems, validation of tribal claims are the need of the hour in order to save the aquatic flora and to maintain the wild progenitors as well as to explore the richness of aquatic flora in the field of drug discovery. There are number of threats observed during the survey of medicinal plants of Mahanadi river basin, which can be mitigated by the conservation of these medicinally important aquatic herbs. In the future, it is, therefore, very important to pursue steps towards the conservation of Mahanadi River and also the medicinal floras of this river basin.



Plate 2: Survey works in Mahanadi river basin

REFERENCES

- Datta S (2009). Aquatic weeds and their management for fisheries. CIFE Centre, Salt Lake City, Kolkata, West Bengal, India.
- Dixit PR, Kar B, Chattopadhyay P, Panda CR. Seasonal Variation of the Physicochemical Properties of Water Samples in Mahanadi Estuary, East Coast of India. *Journal of Environmental Protection*. 2013; 4: 843-848.

- Kumar S, Mahanti P, Balakrishnan P and Dhal NK (2018). Mahanadi: Hub of Medicinal Plants and Associated Taxa. APRF Publishers, Odisha.
- Marndi S, Mishra S and Mishra AK. Wetland flora of Odisha against skin infections. *Journal of Biodiversity and Conservation*. 2020; 4(2): 328-340.
- Mitra SK, Venkateswarlu (1998). An Overview. Fauna of Mahanadi Estuary, Estuarine Ecosystem Series. Zoological Survey of India, Calcutta.
- Nayak RK, Nayak PK, Choudhury BP. Some medicinal weeds of Mahanadi delta. *Journal of Economic and Taxonomic Botany*. 2003; 27(3):533-538.
- O'Hare MT, Aguiar FC, Asaeda T, Bakker E, Chambers PA, Clayton JS, Elger A, Ferreira TM, Gross EM, Gunn IDM, Gurnell AM, Hellsten S, Hofstra DE, Li W, Mohr S, Puijalón S, Szoszkiewicz K, Willby NJ, Wood KA. Plants in aquatic ecosystems: Current trends and future directions. *Hydrobiologia*. 2018; 812: 1-11.
- Subudhi HN, Choudhury BP, Acharya BC. Some potential medicinal plants of Mahanadi delta in the state of Orissa. *Journal of Economic and Taxonomic Botany*. 1992; 16(2): 479-487.
- Swapna MM, Prakashkumar R, Anoop KP, Manju CN and Rajith NP. A review on the medicinal and edible aspects of aquatic and wetland plants of India. *Journal of Medicinal Plants Research*. 2011; 5(33): 7163-7176.

Indigenous Traditional Knowledge (ITK) on wild edible fruits of Eastern Ghats, India

Sundar S Mety¹, Sonal Desai^{2*}, Tambe Satish Sampatrao³, Vandana Sharma⁴ and Sanjeet Kumar⁵

¹Department of Botany, Sri Gavissideshwara Arts Science and Commerce Degree College, Koppal, Karnataka, India

²Department of Pharmaceutical Quality Assurance, SSR College of Pharmacy, Silvassa Campus, Dadra & Nagar Haveli, India

³Department of Botany, MGV'S Arts Science and Commerce College, Manmad, Maharashtra, India

⁴Department of Life Sciences & Biological Sciences, IES University, Bhopal, Madhya Pradesh, India

⁵Institute of Biological Sciences, Cuttack, Odisha, India

*Email-id: sdesai6381@gmail.com

DOI: 10.5281/zenodo.6363862

ABSTRACT

Eastern Ghats is mainly distributed in four states in India namely Odisha, Andhra Pradesh, Tamil Nadu and Karnataka, known for its rich floral and faunal diversity. The indigenous people live in Eastern Ghats (EGs) close to or within the forest, depend upon the forest for food, medicines, timber, firewood etc which are important to their livelihood. Among them, the diversity of wild edible fruits helps the ethnic groups in many aspects. Different traditional knowledge is also associated with these wild edible fruits. The present days we don't have time to get the information associated with the nature as the nature is having power to provide what we need at any time anything, only the thing is we have to acquire knowledge and uses of such wild plants and their parts. Keeping this in mind, an attempt has been taken to document the ITK on wild edible fruits of EGs to conserve the disappearing valuable information. In present study, a total of 20 commonly used wild edible fruit plants belonging to 18 genera and 14 families with their traditional uses are documented.

Keywords: Wild edible fruits, Ethnic communities, Indigenous practices, Non-timber forest products

INTRODUCTION

The term "Indigenous" is defined as "Groups of people whose social, cultural and economic conditions distinguish them from other sections of the national communities and whose status is regulated wholly or partially by their own customs or traditions or by special laws or regulations". Indigenous Traditional knowledge can be defined as a network of knowledge, beliefs and traditions intended to preserve, communicate and contextualize indigenous relationships with culture and landscape over time (Bruchac 2014). Indigenous people and local communities play an important role in the conservation and management of biodiversity (Mauro and Hardison 2000). Eastern Ghats, a zone with rich biodiversity. The part of EGs found in Odisha covers 18 districts, 15 districts in Andhra Pradesh and 9 districts in Tamil Nadu while in Karnataka, it falls in part of Chamrajnagar and Kolar (Anonymous 2007). Most of the tribal population is concentrated in the EGs of high-altitude zone. Livelihood or occupation of these tribes varies from area to area depending on topography, availability of forests,

land, water, etc (Sastry 2002; Naidu and Yugandar 2002). As majority of the tribal communities live close to or within the forest, a number of wild plants used by them contribute significantly to their livelihood (Mahapatra and Panda 2012). Among them, wild edible fruits are the important sources of nutrition, medicine and also a source of their livelihood as Non-Timber Forest Products (NTFPs) (Sardeshpande and Shackleton 2019). It is documented that consumption of wild edible fruits reduces the risk of several ailments like diabetes, coronary heart disease, etc. as they are the rich source of vitamins, macro and micro minerals, fibres, polyphenol and antioxidants (Biswas *et al.*, 2018). The diversity of indigenous edible fruits helps the ethnic groups in many ways. Gathering of wild edible fruits, preserving them and consuming them during times of food scarcity have been practiced from long history among the indigenous people of Eastern Ghats. In the past, the collection and the selling of NTFPs and other forest products was treated as the primary source of income for the primitive tribes, but now with the degradation of forest, these practices are also going extinct along with the indigenous traditional knowledge associated with. Nowadays, only certain primitive tribes which inhabit the interior forests mainly depend on the forest resources. This chapter highlights indigenous traditional knowledge on some edible fruits of EGs of India. This report will help to conserve the ethno-botanical knowledge on wild edible fruits traditionally used by the tribal and rural peoples of the EGs, India.

METHODOLOGY

Field and literature (Bhairavamurthy 1982; Dni 1982; Mahapatra and Panda 2012) survey was made to enumerate the commonly available wild edible plants in EGs (Figure 1). The uses were collected from EGs part of Odisha state through filed survey using Passport Data Form (PDF) and plants were identified by Dr. Sanjeet Kumar, Chief Executive Officer (CEO), Ambika Prasad Research Foundation, Odisha, India. Traditional medicine healers and locals were interviewed to know the food and medicinal values of the plants. The vernacular name(s) and parts used, was recorded. The recorded plants are arranged in alphabetical order by their botanical names along with their families and ITK.

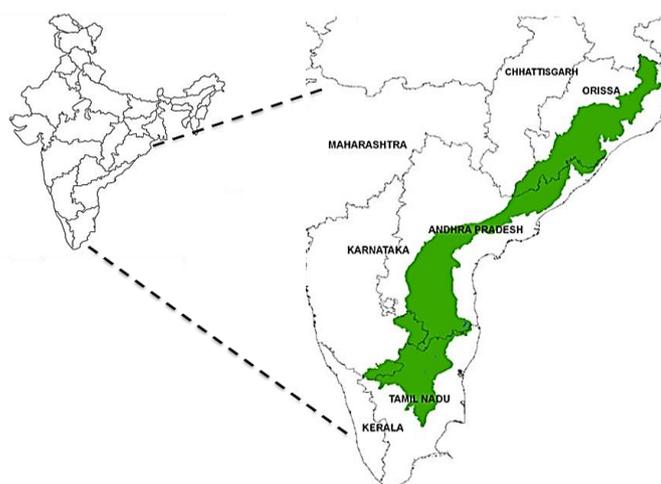


Figure 1: Geographical location of study areas through field and literature survey

RESULTS AND DISCUSSION

The field and literature survey on ITK of wild edible fruits revealed that a total of 20 commonly used fruit plants belonging to 18 genera and 14 families were recorded from study areas (Table 1; Figure 1; Figure 2). All utilized plant species are indigenous species including *Aegle marmelos*, *Terminalia bellirica*, *Terminalia chebula*, *Diospyros melanoxylon*, *Ficus racemosa*, etc. Among them, the some fruits are eaten raw like *Aegle marmelos*, *Antidesma ghaesembilla*, *Bridelia retusa*, *Buchanania lanzan*, *Diospyros melanoxylon*, *Ficus racemosa*, *Hibiscus sabdariffa*, *Limonia acidissima*, *Madhuca longifolia*, *Phyllanthus emblica*, *Syzygium cumini*, *Tamarindus indica* and *Ziziphus mauritiana*. Fruits of *Aegle marmelos*, *Diospyros melanoxylon*, *Morinda pubescens* are used in the problems related to stomach and digestion. Likewise fruits of *Bridelia retusa*, *Ficus racemosa*, *Syzygium cumini* are potential against diabetes. Fruits of *Flacourtia indica*, *Terminalia bellirica*, *Terminalia chebula*, *Phyllanthus emblica* are used in colds and coughs. The most dominant families were found to be Phyllanthaceae (3 species), Rutaceae (2 species), Combretaceae (2 species), Rhamnaceae (2 species). Rest of the families like Anacardiaceae, Dilleniaceae, Ebenaceae, Moraceae, Salicaceae, Sapotaceae, Rubiaceae, Myrtaceae, Malvaceae represent only one species (Table 1).

Table 1: Indigenous Traditional Knowledge on some commonly available wild edible fruits of EGs, India

Plant Name	Vernacular name (s)	Family	Use (s)
<i>Aegle marmelos</i>	Bel	Rutaceae	Fruit juice is used for cooling and also against stomach problems.
<i>Antidesma ghaesembilla</i>	Matha sag	Phyllanthaceae	The fully ripen fruits are eaten raw or cooked and used in sore throat.
<i>Bridelia retusa</i>	Kasi	Phyllanthaceae	Raw fruits are used in diabetes
<i>Buchanania lanzan</i>	Chironji	Anacardiaceae	Fruits are used in treating cough and asthma.
<i>Dillenia indica</i>	Oou	Dilleniaceae	Fruit juice used in skin problems.
<i>Diospyros melanoxylon</i>	Kendu	Ebenaceae	Raw fruits are edible and used to treat stomach disorder.
<i>Ficus racemosa</i>	Cluster fig	Moraceae	Raw fruits are used to treat diabetes.
<i>Flacourtia indica</i>	Ramontchi	Salicaceae	Fruits are used to prevent cough and colds.
<i>Hibiscus sabdariffa</i>	Ipil	Malvaceae	Fruits are used to make chutney and potential against fever.
<i>Limonia acidissima</i>	Kaitha	Rutaceae	Fruits are used in the treatment of diarrhoea and dysentery.
<i>Madhuca longifolia</i>	Mahua	Sapotaceae	Fruits are used to make country liquor and used to treat ulcer.

<i>Morinda pubescens</i>	Aachu	Rubiaceae	Fruits are used in stomach pain.
<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae	Raw fruits are used against cough.
<i>Syzygium cumini</i>	Jamun	Myrtaceae	Fruits are edible and used to treat diabetes.
<i>Tamarindus indica</i>	Imli	Fabaceae	Raw or ripen fruits are edible and used in dysentery.
<i>Terminalia bellirica</i>	Bahada	Combretaceae	Fruit powder is used in cough.
<i>T. chebula</i>	Harida	Combretaceae	Fruit powder is used in cough.
<i>Xylia xylocarpa</i>	Kangada	Fabaceae	Decoction of fruit is used in sore throat.
<i>Ziziphus mauritiana</i>	Ber	Rhamnaceae	Berries are eaten raw and used in fever.
<i>Z. oenoplia</i>	Makai	Rhamnaceae	Fruits are dried and make powder. The powder is used in constipation.

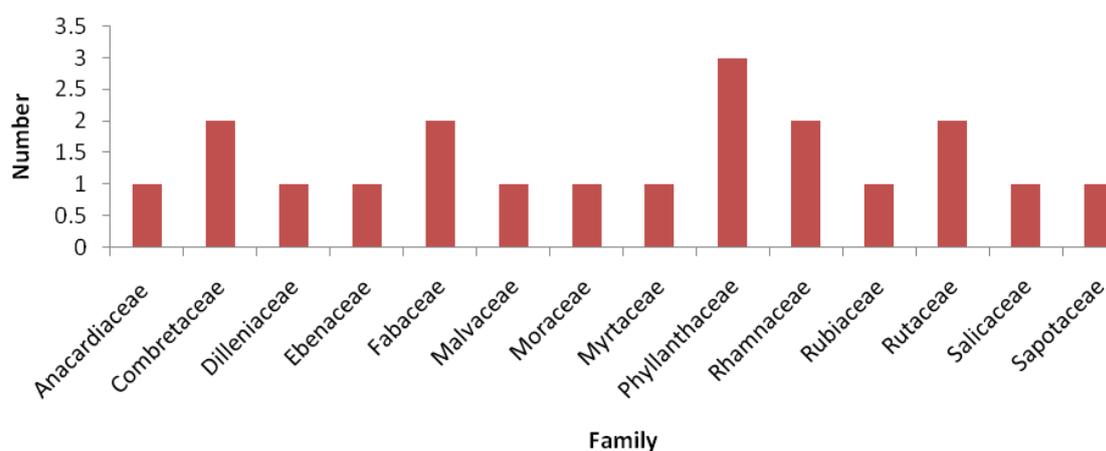


Figure 2: The diversity of commonly used wild edible fruits of EGs, India

As per literature, a lot of work has been done on the indigenous knowledge of edible fruits and edible plants from different parts of our globe. We have documented some valuable findings of uses of wild fruits as folk medicines from our study areas. In 2006, Acharya and Acharya documented a total of 67 species of both angiosperm and mushrooms belonging to 41 families under 57 genera from Parroha VDC of Rupandehi district, Central Nepal. Among the 41 families documented, Leguminosae and Moraceae present the highest number of species. In 2008, Ali-Shtayeh et al. recorded 100 wild edible plant species from Palestinian Authority, PA (northern West Bank). The most significant species reported were *Majorana syriaca*, *Foeniculum vulgare*, *Malva sylvestris*, *Salvia fruticosa*, *Cyclamen persicum*, *Micromeria fruticosa*, *Arum palaestinum*, *Trigonella foenum-graecum*, *Gundelia tournefortii*, and *Matricaria aurea*.



Plate 1: Some commonly available edible fruits of Eastern Ghats A) *Antidesma ghaesembilla*, B) *Bridelia retusa*, C) *Diospyros melanoxylon*, D) *Ziziphus oenoplia*, E) *Syzygium cumini*, F) *Tamarindus indica*, G) *Terminalia bellirica*, H) *Terminalia chebula*

Desmukh and Waghmode in 2011, reported 11 fruiting plants which play an important role in the nutrition of people and children in rural and tribal communities. These fruits are excellent sources of vitamins, carbohydrates, proteins, fibres, minerals and enormous medicinal potential. These fruits can be eaten raw or in processed form. These fruits from forests are rich source of protein and energy and very useful in treating protein energy deficiency. In 2012, Mahapatra and Panda reported some 56 wild edible fruiting plant species belonging to 40 genera and 26 families from Eastern India with their habit, local names, parts used and mode of consumption. According to them, trees and shrubs made up the highest proportion of edible wild fruit species (70 % tree, 19 % shrub and 11 % climbers) but the report lacked indigenous knowledge associated with the fruits and the indigenous communities. Interactions with them thus result in acquiring traditional knowledge about the uses of wild edible fruits in the study area as food and/or medicine. In 2017, Maroyi & Cheikhoussef documented 60 fruit plants belonging to 14 families from Namibia and Zimbabwe with indigenous knowledge. The most dominant families were Anacardiaceae and Moraceae with 6 species each, 5 species from Phyllanthaceae, 4 species each from Ebenaceae, Loganaceae and Malvaceae and 3 species from Rubiaceae. Biswas et al. (2018) reported 15 species of wild edible fruits belonging to 13 families from Khowai, West Tripura, Dhalai, and Sipahijala districts. According to them, the indigenous people preserved their traditional knowledge about the uses of these plant species, i.e., food, medicine, etc., from generation to generation. Majority of the fruits are eaten when ripe, some fruits are eaten as vegetables, pickles, and in form of raw chutney. In 2021, Kumar et al. reported 63 commonly available plant species with Indigenous Traditional Practices from 29 villages of mining areas of Koira Range, Bonai Forest Division, Odisha. Maximum species belong to the Fabaceae family followed by Asteraceae, Dioscoreaceae and Rubiaceae. They mentioned the Traditional Practices of some fruit bearing plants like *Terminalia bellirica*, *Terminalia chebula*, *Aegle marmelos*, *Antidesma ghaesembilla*, *Bridelia retusa*, *Diospyros melanoxylon*, *Hibiscus sabdariffa*, *Phyllanthus emblica*, *Syzygium cumini* etc.

CONCLUSION

The ethnic communities in Eastern Ghats are rich in traditional knowledge due to long term association with forests. The present study demonstrated that wild edible fruit plants provide rural communities with a wide range services including food sources, herbal medicines, timber, firewood which are important to their livelihood. The habit of using wild edible plants is still alive in Eastern Ghats, but is disappearing slowly and giving alarm to conservation and documentation of indigenous and tradition knowledge. Therefore it is vital to do more research on potential wild edible fruits as millions of people throughout the world make extensive use of this category of plant resources to fulfil their livelihood needs and often have considerable knowledge on their uses with scientific validation. It is also important to record, preserve and infuse this knowledge to the future upcoming generation. Hence, this valuable information needs to be documented before it disappears and cause heavy loss to human health.

REFERENCES

- Acharya KP and Acharya R. Eating from the wild: indigenous knowledge on wild edible plants in Parroha VDC of Rupandehi district, Central Nepal. *International Journal of Social Forestry*. 2010; 3(1):28-48.
- Ali-Shtayeh MS, Jamous RM, Al-Shafie' JH et al. Traditional knowledge of wild edible plants used in Palestine (Northern West Bank): A comparative study. *Journal of Ethnobiology and Ethnomedicine*. 2008; 4:13.
- Anonymous (2007). Biodiversity Characterization at landscape level in Eastern Ghats an East Coast using satellite remote sensing and Geographic Information System, NRSA, Hyderabad.
- Bhairavamurthy PV. (1982). Environmental aspects of Eastern Ghats. Proc. National Seminar on Resources, Development and Environment of Eastern Ghats, pp. 135-138, Andhra University, Vishakapatnam.
- Biswas SC, Majumdar M, Das S and Mishra TK. Diversity of wild edible minor fruits used by ethnic communities of Tripura, India. *Indian Journal of Traditional Knowledge*. 2018; 17(2): 282-289.
- Bruchac and Margaret M. (2014). Indigenous Knowledge and Traditional Knowledge. In *Encyclopedia of Global Archaeology*. Claire Smith, Springer Science and Business Media, New York.
- Dani CS. (1982). Vegetation of Eastern Ghats of Orissa. Proceedings of the National Seminar on Resources, Development and Environment of the Eastern Ghats, pp 43-46, Andhra University, Visakhapatnam.
- Deshmukh BS and Waghmode A. Role of wild edible fruits as a food resource: Traditional knowledge. *International Journal of Pharmacy and Life Sciences*. 2011; 2(7): 919-924.
- Kumar SN, Mishra S and Kumar S. Documentation of Indigenous Traditional Knowledge (ITK) on Commonly Available Plants in Koira Range, Bonai Forest Division, Sundargarh, Odisha, India. *Asian Plant Research Journal*. 2021; 8(4): 83-95
- Lakra WS and Sarkar UK. Evaluation of Fish Biodiversity of Eastern Ghats Region for Conservation and Sustainable Utilization. *ENVIS Newsletter*. 2006; 12(3): 2-7.
- Mahapatra AK and Panda PC. Wild edible fruit diversity and its significance in the livelihood of indigenous tribal: evidence from eastern India. *Food Security*. 2012; 4(2): 219-234.
- Maroyi A and Cheikhoussef A. Traditional knowledge of wild edible fruits in southern Africa: A comparative use patterns in Namibia and Zimbabwe. *Indian Journal of Traditional Knowledge*. 2017; 16(3):385-92.
- Mauro F and Hardison P. Traditional Knowledge of Indigenous and Local Communities: International Debate and Policy Initiatives. *Ecological Applications*. 2000; 10(5): 1263-1269.
- Naidu TS and Yugandar DR. Economic dependency of Scheduled Tribes in Eastern Ghats of Andhra Pradesh. National Seminar on Conservation of Eastern Ghats, March 24-26, 2002, held at Tirupati, Andhra Pradesh.
- Sardeshpande M and Shackleton C. Wild edible fruits: A systematic review of an under-researched multifunctional NTFP (non-timber forest product). *Forests*. 2019; 10:467. DOI: 10.3390/f10060467.
- Sastry VNVK. Changing Tribal Economy in Eastern Ghats problems and prospects. National Seminar on Conservation of Eastern Ghats, March 24-26, 2002, held at Tirupati, Andhra Pradesh.

Medicinally important common orchids of India

Anushka Chakraborty¹, Nabendu Pal², Harsha Ashish Thanvi³, Annapurna Dhal⁴,
Chandrima Debi⁵, Sanjeet Kumar^{*6} and Sweta Mishra⁶

¹Department of Botany, Calcutta University, Kolkata, West Bengal, India

²Department of Botany, Ramkrishna Mission Vivekananda Centenary College, Rahara,
Kolkata, West Bengal, India

³Dr. D. Y. Patil College of Ayurved and Research Centre, Pimpri, Pune, Maharashtra, India

⁴Department of Zoology, BB College, Baiganbadia, Mayurbhanj, Odisha, India

⁵Forest Research Institute, Dehradun, Uttarakhand, India

⁶Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sanjeetaprf@gmail.com, chandrima.debi@gmail.com

DOI: 10.5281/zenodo.6376109

ABSTRACT

India, being a mega-diverse country enjoys almost all types of vegetation with great floral diversity. Among its floral wealth, the diversity of orchids plays an important role in both economical and medicinal aspects. Orchids, belonging to the family Orchidaceae exhibit an incredible range of diversity in size, shape and colour of their flowers. They are used in various aspects of life but less information is documented on their medicinal potential. Therefore, an attempt has been made to study the ethnobotanical values of orchid species in selected states of India (Odisha, Jharkhand, Kerala and Manipur). The results revealed that about 20 species of orchid are commonly used as medicinal agent. Present study highlights the importance of orchid species for formulation of drugs.

Keywords: Orchids, Ethnobotany, India, medicinal values

INTRODUCTION

Orchids are the flowering plants belong to the family Orchidaceae. It is the second largest families of flowering plants of the world (Rajendran *et al.*, 1997; Ninawe and Swapna 2017). They are the most highly evolved flowering plants having a wide ecological range (Hagsater and Dumont 1996). India has a characteristic geographic location with terrestrial land of about 15,200 km with a 7,516 km coastline (Raju *et al.*, 2010) India, being a mega-diverse country, lies at the junction of three major biogeographic realms, namely the Indo-Malayan, the Eurasian and the Afro-tropical, possesses a wide range of climate and vegetation types. India is the home of about 19,530 species of flowering plants among them about 5400 species fall under endemic (Raju *et al.*, 2010). Among them, about 1300 species of about 184 genera comes from the family Orchidaceae, which is nearly 7% of world's orchid genetic diversity (Pal and Nagrare 2006). Some are terrestrial, which grows in damp woods and grassy slopes. Most orchid species are epiphytes (Rajendran *et al.*, 1997). Since primitive, orchids have been used as traditional herbal drugs. Very fewer studies have been done regarding the traditional knowledge of orchids for medicinal uses. A number of bioactive compounds are separated like alkaloids, flavonoids, phenanthrenes, terpenoids, bibenzyl derivatives, nitrogenous organic heterocyclic molecules having pharmacological values etc (Kumar *et al.*, 2021; De *et al.*, 2015; Pant 2013; Priya and Krishnaveni 2005). The authors also mentioned that the tribal use the extract of *Habenaria*, particularly *H. plantaginea* and *H.*

roxburghii for scorpion and snake bites. In 2013, Behera et al. reported that leaf paste of *Acampe praemorsa* and *Lusia zeylanica* and aerial root paste of *Cymbidium aloifolium* are useful in fixing human bone fractures. The ethno-botanical values of some orchid are also discussed in “Charaka Samhita” (Behera et al., 2013). Some orchid species are also used in ‘Astavarga’ group of drugs in Ayurvedic system of medicine. Various plant parts like leaves, roots, stem, and bulbs are used for curing ailments in traditional medicine (Ninawe and Swapna 2017). The Eastern Himalayas and North Eastern, North West Himalayas, Peninsular India and Andaman & Nicobar Islands are the major orchid regions of India. Some orchid species like *Dendrobium nobile*, *Eulophia campestris*, *Orchis latifolia*, *Vanda roxburghii* and *Vanda tessellate* have been documented for their medicinal values. Keeping the importance of orchid as a source of medicinal agents an attempt has been made to document the medicinal values of orchid from selected states of India.

METHODOLOGY

An extensive research survey was done on the diversity and medicinal properties of orchid species in some particular district of selected states of India (Odisha, Jharkhand, Kerala, and Manipur) along with literature survey (Haines 1925; Saxena and Brahman 1995; Misra 2007, Rao and Kumar 2018) (Figure 1). Ethno medicinal uses of the plants were first extracted from the local and available literature (Kumar et al., 2021).



Figure 1: Geographical locations of study areas

RESULTS AND DISCUSSION

Study revealed that some orchid species like *Acampe praemorsa*, *Aerides multiflora*, *Bulbophyllum careyanum*, *Calanthe triplicata*, *Coelogyne nitida*, *Dendrobium amoenum*, *Habenaria furcifera* etc. are used in various diseases and disorders. Various plant parts like leaves, roots, stem, and pseudo bulbs are used for curing ailments by the tribal and local communities. Leaves of the orchid species are mainly used in various diseases like leaf paste of *Acampe praemorsa* is used against rheumatism and pains, leaf Juice of *Luisia zeylanica* is used to treat wounds, boils and burns etc. Pseudo bulbs are also play an important role in traditional medicines like paste of pseudo-bulbs of *Coelogyne nitida* is used to relieve headache, paste of pseudo-bulbs of *Dendrobium crepidatum* is used for bone fractures etc. here we enlisted 20 most common orchid species of epiphytic and terrestrial habitat which are commonly used by the traditional people in traditional medicines (Table 1; Plate 1).

Table 1: Some commonly used medicinal orchids from selected states of India

Plant name	Habitat	Parts used	Medicinal values	Sources
<i>Acampe praemorsa</i>	Epiphytic	Leaf	Leaf paste is used against rheumatism and pains.	Present study
<i>Aerides multiflora</i>	Epiphytic	Leaf	Leaf paste applied to treat cuts and wounds.	Panda and Mandal (2013)
<i>Bulbophyllum careyanum</i>	Epiphytic	Leaf	Powder of leaves is used to cause abortion.	Pant (2013)
<i>Calanthe tricarinata</i>	Terrestrial	Leaf	Leaf paste applied on sores and eczema.	Pant (2013)
<i>Calanthe triplicata</i>	Terrestrial	Root	Roots are chewed for diarrhoea.	De et al. (2015)
<i>Coelogyne nitida</i>	Epiphytic	Pseudo bulbs	Pseudo-bulbs paste and juice are used in headache	Pant (2013)
<i>Coelogyne prolifera</i>	Epiphytic	Pseudo bulbs	Pseudo-bulbs paste to relieve headache and fever.	Present study
<i>Dendrobium amoenum</i>	Epiphytic	Whole plant	Whole plant paste is used to cure burnt skin and dislocated bones.	Present study
<i>Dendrobium crepidatum</i>	Epiphytic	Pseudo-bulb	Paste of pseudo-bulbs is used for bone fractures.	Present study
<i>Eulophia dabia</i>	Terrestrial	Rhizome	Rhizome paste is used in cough and cold.	Pant (2013)
<i>Habenaria commelinifolia</i>	Terrestrial	Whole plant	Whole plant paste is used in skin diseases.	Present study
<i>Habenaria furcifera</i>	Terrestrial	Whole plant	Whole plant paste is used in wound-healing.	Present study
<i>Habenaria marginata</i>	Terrestrial	Tubers	Tuber paste is used in wounds.	Present study
<i>Liparis odorata</i>	Terrestrial	Leaf	Leaf paste is used to treat diabetic ulcer.	Panda and Mandal (2013)
<i>Luisia zeylanica</i>	Epiphytic	Leaf	Leaf Juice is used to treat wounds, boils and burns.	Present study
<i>Pholidota imbricata</i>	Epiphytic	Pseudo-bulb	Pseudo-bulb with mustard oil is used in joint pain.	Panda and Mandal

				(2013)
<i>Rhynchosyilis retusa</i>	Epiphytic	Leaf	Leaf juice is used in constipation.	Panda and Mandal (2013)
<i>Spiranthes sinensis</i>	Terrestrial	Root & stem	Paste of roots and stem is applied in sores	Pant (2013)
<i>Vanda tessellata</i>	Epiphytic	Leaf	Paste of leaves is used in fever.	Present study
<i>Vanda testacea</i>	Epiphytic	Leaf	Extract of fresh leaf drops is used in earache.	Present study

Bulpitt in 2005 studied that *Cyrtorchis arcuata* can be used in the treatment of diabetes. *Eulophia cucullata* in preventing epilepsy, *Bulbophyllum maximum* against sorcery and the *Tridactyle tricuspis* is used in the treatment of madness. Here authors investigated that the *Dendrobium amoenum*, *Dendrobium crepidatum* are used in dislocated bone and in bone fracture. Singh *et al.* (2012) recorded the phytochemicals present in orchids, their medicinal and pharmacological properties. According to them *Dendrobium candidum* showed anti-hyperglycemic effect and stimulates secretion of insulin from beta cells and also inhibits secretion of glucagon from cells. Leaves of *Gastrodia elata* help to induce neuronal cell death and also provide neuro-protection by preventing brain damage. Shengji and Zhiwei (2018) reported that there are about 300 orchid species are used in traditional Chinese medicines. The most common used species are *Gastrodia alata*, *Dendrobium* species, *Bulbophyllum* spp., *Arundina graminifolia*, *Eria pannea*, *Vanda roxbunghii*, *Calanthe alismaefolia*, *Cymbidium* spp., *Gymnadenia conopsea*, *G. crassinervis*, *Thunia alba* etc.

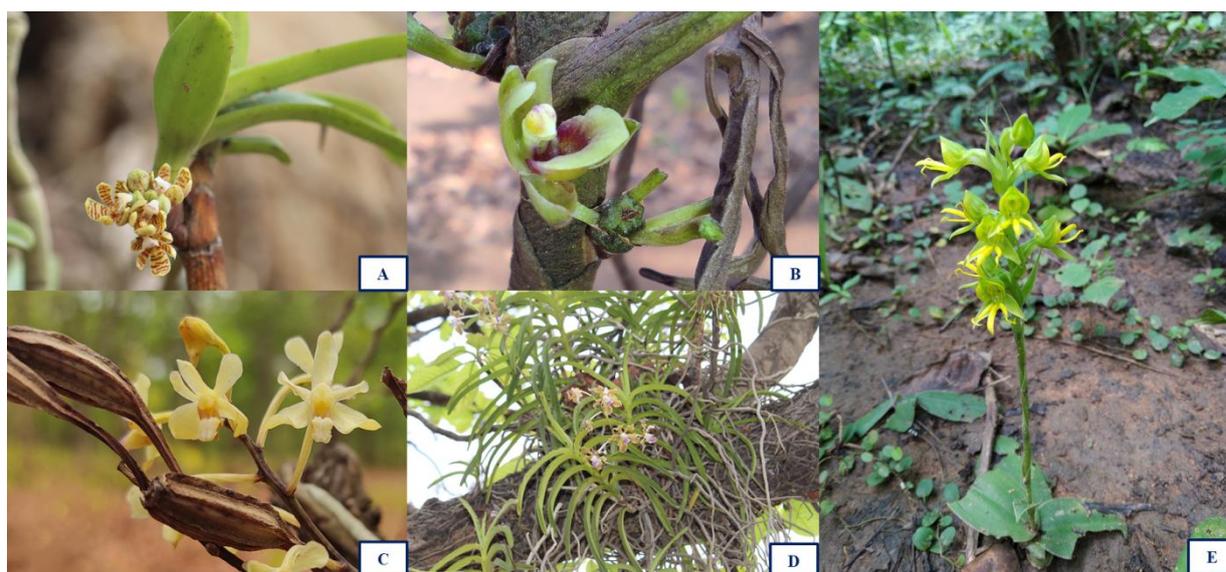


Plate 1: Some common medicinal orchids of India A) *Acampe praemorsa*, B) *Luisia zeylanicam*, C) *Vanda testacea*, D) *Vanda tessellate*, E) *Habenaria marginata*

CONCLUSION

Orchids are generally known for its fascinating and colourful flowers and very less known for their medicinal uses. The present study highlights the importance of

orchids as medicinal agent which will be helpful to do value addition for herbal formulations and sustainable conservation plan.

REFERENCES

- Behera D, Rath CC and Mohapatra U. Medicinal orchids in india and their conservation: a review. *Floriculture and Ornamental Biotechnology*. 2013; 7(1): 53-59.
- De LC, Rao AN, Rajeevan PK, Srivastab M and Chhetri G. Morphological Characterization in *Dendrobium* species. *Journal of Global Bioscience*. 2015; 4(1): 1198-1215.
- Hágsater E and Dumont V. (1996). Orchids. Status survey and conservation action plan. IUCN, Gland.
- Haines HH. (1924). The Botany of Bihar and Orissa. Adlard & Sons, London.
- Kumar S, Mishra S and Mishra AK. Diversity of orchid species of Odisha state, India. With note on the medicinal and economic uses. *Richardiana*. 2021; 5: 1-26.
- Misra S. (2007). Orchids of India: a glimpse. Bishen Mahendra Pal Singh, Dehradun.
- Ninawe AS and Swapna TS. Orchid diversity of northeast India – traditional knowledge and strategic plan for conservation. *Journal of the Orchid Society of India*. 2017; 31: 41-56.
- Pal R and Nagrare VS. (2006). Orchid diversity of India: its conservation and sustainable utilization. National Research Centre for orchid, Sikkim.
- Panda AK and Mandal D. The folklore medicinal orchids of Sikkim. *Ancient science of life*. 2013; 33(2): 92–96.
- Pant B. Medicinal orchids and their uses: Tissue culture a potential alternative for conservation. *African Journal of Plant Science*. 2013; 7(10): 448-467.
- Priya K and Krishnaveni C. Antibacterial effect of *Bulbophyllum neilgherrense* wt. (Orchidaceae) An *in-vitro* study. *Ancient Science of Life*. 2005; 25(2): 50-52.
- Rajendran A, Rao NR, Kumar KR and Henry AN. Some medicinal orchids of Southern India. *Ancient Science of Life*. 1997; 17(1):10-4.
- Raju VS, Reddy CS and Suthari S. Flowering plant diversity and endemism in India: an overview. *ANU Journal of Natural Sciences*. 2010; 2(1): 27–39.
- Rao AN and Kumar V. Updated checklist of orchid flora of Manipur. *Turczaninowia*. 2018; 21(4): 109-134.
- Saxena HO and Brahmam M. (1995). The flora of Orissa. Orissa Forest Development Corporation & RRL, Bhubaneswar.
- Singh S, Singh AK, Kumar S, Kumar M, Panday PK and Singh MCK. Medicinal properties and use of orchids, a concise review. *Applied Botany*. 2012; 52: 11627-11634.
- Shengji P and Zhiwei Y. Orchids and its uses in Chinese medicine and health care products. *Medical Research and Innovations*. 2018; 2(1):1-3.
- Bulpitt CJ. The Uses and Misuses of Orchids in Medicine. *An International Journal of Medicine*. 2005; 98: 625-631.

Plants used in old age problems

Romita Devi¹, Dwaipayan Sinha^{2*}, Suchetana Mukherjee³, Sanjeet Kumar⁴ and Sweta Mishra⁴

¹MLSM College, Sundernagar, Mandi, Himachal Pradesh, India

²Department of Botany, Government General Degree College, Mohanpur, Paschim Medinipur, West Bengal, India

³Department of Botany, Sripat Singh College, Jiaganj, Murshidabad, West Bengal, India

⁴Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

*Email-Id: dwaipayansinha@hotmail.com

DOI: 10.5281/zenodo.6376147

ABSTRACT

Aging is a biological phenomenon and is often accompanied by several health complications resulting from imbalance or anomalies in the physiological functions of the body. Geriatric syndromes are complex, with common risk factors such as advanced age, cognitive impairment, functional disability, and decreased mobility. Our study objective was to identify the traditional use of medicinal plants by the elderly. A survey was done throughout Odisha to study the plants used in old age problems through many questionnaires and to survey socio-demographic information and issues related to plants. The results revealed that 61 plant species are used in different diseases and disorders in old age like alzheimer's disease, arthritis, cholesterol, diabetes, glaucoma, cardio-vascular disease, blood pressure, renal failure, parkinson's disease, osteoporosis, flu, cataract and pneumonia belonging to 35 families. These plant species are present in the daily lives of these people as a therapeutic method. The elderly make use of medicinal plants as an important therapeutic resource and we recommend that further studies be conducted to confirm reported activities of these medicinal plants.

Keywords: Elderly, Traditional, Therapeutic, Ethnomedicine, Aging

INTRODUCTION

Aging is a natural process that is also a biological phenomenon with psychological repercussions caused by irreversible cell and system deterioration, and it is also a social and cultural fact as a phase in the life cycle in its many dimensions (Freitas *et al.*, 2010; Unal and Ozdemir 2019). In the 21st century, older adults population has been steadily increasing in percentage all over the world (Turkbeyler *et al.*, 2019). Geriatric giants refer to the principal chronic disabilities of old age that impact the physical, mental and social aspects of older adults. The most common old age giants are like falls, dementia, urinary incontinence and immobility. All of these diseases are commonly misperceived to be an unavoidable part of old age. Prevention of geriatric giants reduces mortality and morbidity in older people (Foley *et al.*, 2012; Vande *et al.*, 2020). The report highlights some most common diseases in old age people along with the plants used to treat the common diseases.

Most common elderly diseases

Alzheimer's disease

Alzheimer's disease is a progressive brain disease that wreaks havoc on memory and thinking skills, as well as the ability to carry out even the most basic tasks. It results in cognitive decline and dementia. Environmental factors, vascular factors as well as psychical factors contribute to the development of alzheimer's disease. To

date, less drugs are available to treat the progression of neurodegeneration in alzheimer's disease (Bhusan *et al.*, 2018; Breijayeh and Karaman 2020).

Arthritis

Arthritis is normally viewed as an acute or chronic joint inflammation that often co-exists with pain and structural damage. Several treatment pathways are now available just to control the disease but no imminent cure is found yet. By nature, arthritis is versatile. Some common forms of arthritis are osteo-arthritis, rheumatoid arthritis, gout, ankylosing spondylitis, lupus arthritis, infectious arthritis, psoriatic arthritis, fibromyalgia etc (Mitra 2013; Senthelal *et al.*, 2021).

Cholesterol

Cholesterol is a type of steroid that is unsaturated alcohol. It's also a component of bile salt, which aids fat-soluble vitamins A, D, E, and K absorption during digestion. There are different etiological roles for various types of cholesterol, such as high and low-density lipoprotein. High levels of cholesterol in the blood can cause fatty deposits, called plaque, to build up in arteries, making blood flow more difficult. High blood cholesterol is a major risk factor for many diseases and can contribute to many forms of diseases, most notably cardiovascular disease or heart disease for stroke (Choubey *et al.*, 2013).

Diabetes

Diabetes is often referred to as diabetes mellitus, a chronic disease that occurs when the pancreas does not produce enough insulin or alternatively, when the body's cells cannot effectively use the insulin it produces or both. It is the condition in which the body does not properly process food for use as energy. Patients with high blood sugar typically experience polyuria (frequent urination), poly dipsia and poly phagia. Diabetes also can cause serious health complications including heart disease, blindness, kidney failure etc (Olokoba *et al.*, 2012; Lal 2016).

Glaucoma

Glaucoma is a set of irreversible, progressive optic neuropathies that can lead to severe visual field loss and blindness. The increased pressure in your eye, called intraocular pressure, can damage the optic nerve. Without proper treatment patients may gradually experience visual field loss, and even lose their sight completely (Schellack *et al.*, 2015).

Cardio-vascular disease

Cardiovascular disease (CVD) is the leading cause of death when a substance called plaque builds up in the walls of the arteries. This build-up narrows the arteries, making it harder for blood to flow through. If a blood clot forms, it can block the blood flow. This can cause a heart attack or stroke. Diagnosis of the risk factors and predictors of CVD can help us detect high-risk patients and prevent the disease, effectively (WHO 2008; Amani and Sharifi 2012).

Blood pressure

Blood pressure is the pressure within the body's primary artery system, measured in millimetres of mercury. It is usually divided into systolic and diastolic measurements. The maximum blood pressure recorded during ventricular contraction is systolic pressure; the minimum pressure recorded shortly before the next contraction is diastolic pressure. The blood pressure is usually expressed as the systolic pressure over the diastolic pressure (e.g., 120/80 mm Hg). A certain amount of pressure is required to keep the blood flowing throughout the body. Smoking or high cholesterol can increase the damage in blood vessels. When the blood pressure is high, the heart has to work much harder to pump the blood around the body. In a small percent of people, kidney disease or abnormal production of hormones from the adrenal glands above the kidney may cause high blood pressure (Williams *et al.*, 2009).

Renal failure

Renal failure is recognized as a major health problem in which the kidneys fail to perform excretory functions leading to retention of nitrogenous waste products from the blood. In such condition patient experience fatigue, some lose their appetite, and some have leg cramps. These problems are caused by waste products that build up in the blood, a condition known as uremia (Thomas *et al.*, 2008; Bindroo *et al.*, 2020).

Parkinson's disease (PD)

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disease characterized by both motor and non-motor features that can impact the function to a variable degree. Other associated features are a loss of smell, sleep dysfunction, mood disorders, excess salivation, constipation, and excessive periodic limb movements in sleep. Risk factors for the disease also include oxidative stress, the formation of free radicals, and several environmental toxins (DeMaagd and Philip 2015; Zafar and Yaddanapudi 2021).

Osteoporosis

Osteoporosis, or "thinning of bones", is a progressive systemic skeletal disease that makes the bone tissues of older adults more fragile and easy to break. Although it is seen in all age groups, most common in older people and women. It is a "silent disease" as there are no symptoms before a fracture. Increased calcium and vitamin D intake, strength training exercises, and weight-bearing exercises such as walking are important to keeping bones healthy (Ferdous *et al.*, 2015; Sozen *et al.*, 2017).

Flu

The common flu is one of the most common diseases in old-age adults. It is a viral infection that requires symptomatic treatment. The sniffles, cough, runny and stuffy nose, headache, body ache, breathing difficulty and the constant bringing up of phlegm are all symptoms of the flu. The fever generally tends to be quite high

and is associated with body pains, generalized fatigue and sometimes even joint pains (Schellack *et al.*, 2014).

Cataract

A cataract is an eye illness in which the typically transparent lens are opacified, obstructing light transmission. It begins when proteins in the eye form clumps that prevent the lens from sending clear images to the retina. A cataract is the leading cause of reversible blindness and visual impairment globally. Blindness from cataract is more common. The ability to see fades with age is effectively lost by the sixth decade of life. The other and more debilitating change with age is the loss of transparency that, if left untreated, eventually manifests as opacification ultimately resulting in loss of vision and inability to perform daily activities. (Lam *et al.*, 2015; Abdelkadera *et al.*, 2015).

Pneumonia

Pneumonia is an inflammation of the lungs caused by infection, can be caused by many kinds of microorganisms (germs) including bacteria, viruses, fungi or parasites. When infected individual coughs or sneezes, these organisms get into the air and breathing in of this air leads to contraction of the illness. It is thus a contagious disease. Pneumonia is a particular concern if you're older than 65 or have a chronic illness or weak immune system. It can also occur in young, healthy people (Mackenzie 2016).

METHODOLOGY

A survey was done from 2018 to 2021 in selected areas of Odisha (Mayurbhanj, Sundargarh, Puri, Cuttack, Khordha, Dhenkanal) to study the plants used in old age problems (Figure 1). Authors interviewed the people (from semi-urban, rural and tribal areas) between the age group 30-70, explaining the study objectives (Plate 1). The random interview was done through Passport Data Form (PDF) related to medicinal plants (Annex-I). Plants were identified by Dr. Sanjeet Kumar, CEO, Ambika Prasad Research Foundation, Odisha, India.

RESULTS AND DISCUSSION

The results revealed that about 61 plant species are used in different diseases and disorders related to the old age like alzheimer's disease, arthritis, cholesterol, diabetes, glaucoma, cardio-vascular disease, blood pressure, renal failure, parkinson's disease, osteoporosis, flu, cataract, pneumonia belonging to 35 families. Fabaceae followed by Lamiaceae represent the highest number of species. The most widely utilized plant organs to prepare remedies were the bark (6), leaves (18), fruits (7), whole plant (17), roots (5), seeds (1), latex (1), aerial part (2), rhizome (4), although branches, stems, peels were also utilized in some remedies. It was observed that among all the parts, generally leaves were mostly used followed by other plant parts during this survey works. Branches, stems and peels were also utilized in some remedies (Figure 2).

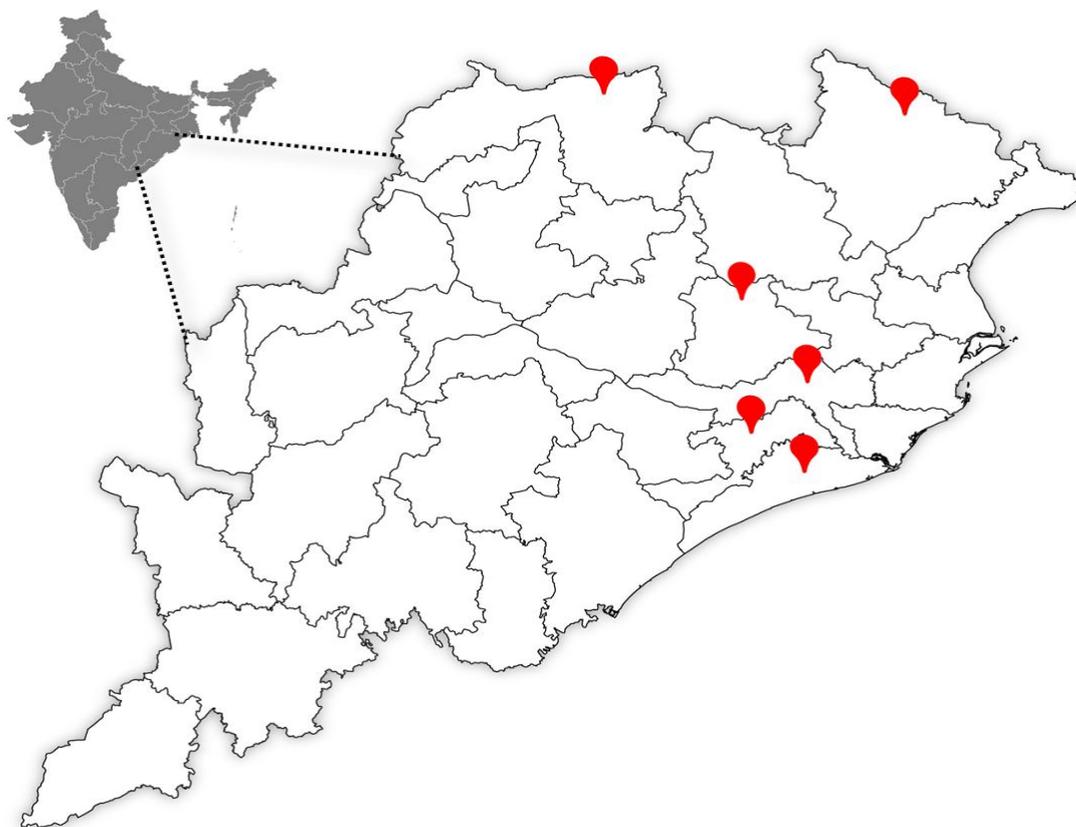


Figure 1: Geographical locations of study areas



Plate 1: Collection of Ethnomedicinal values on plants used in old-age problems

Table 1: Plants used in some common old age problems

Disease	Plant Name	Family	Parts used	Mode of uses
Alzheimer's Disease	<i>Withania somnifera</i>	Solanaceae	Root	Juice is taken after meal in night.
	<i>Centella asiatica</i>	Apiaceae	Whole plant	Consumed as a leafy vegetables.
	<i>Bacopa monnieri</i>	Plantaginaceae	Whole plant	Consumed as a leafy vegetables.
	<i>Curcuma longa</i>	Zingiberaceae	Rhizome	Juice is taken in the morning.
	<i>Celastrus paniculatus</i>	Celastraceae	Seed	Seed oil is used for head massage.
Arthritis	<i>Strychnos nux-vomica</i>	Loganiaceae	Seed	Oil is used to massage.
	<i>Tinospora cordifolia</i>	Menispermaceae	Stem	Juice is taken in the morning.
	<i>Holarrhena pubescens</i>	Apocynaceae	Leaf	Paste of leaves and latex applied externally.
	<i>Bauhinia purpurea</i>	Fabaceae	Bark	Bark paste is applied externally.
	<i>Sida acuta</i>	Malvaceae	Root & Leaf	Root & leaves paste is used.
	<i>Zingiber zerumbet</i>	Zingiberaceae	Rhizome	Rhizome paste is applied externally.
Cholesterol	<i>Zea mays</i>	Poaceae	Seed	Its flour is used in meals.
	<i>Punica granatum</i>	Lythraceae	Fruit	Juice is taken with meal.
	<i>Citrus lemon</i>	Rutaceae	Fruit	Fruit are consumed in meal and salad.
	<i>Allium cepa</i>	Liliaaceae	Bulb	Used in meal & salad.
	<i>Allium sativum</i>	Liliaaceae	Bulb	Used in meal & mixed with yogurt.
	<i>Zingiber officinalis</i>	Zingiberaceae	Rhizome	The powder

				is eaten with yogurt.
Diabetes	<i>Gymnema sylvestre</i>	Asclepiadaceae	Leaf	Three to four leaves eaten daily in the morning.
	<i>Andrographis paniculata</i>	Acanthaceae	Leaf	Juice is taken in the morning on an empty stomach.
	<i>Momordica charantia</i>	Asclepiadaceae	Fruit	Juice is taken in the morning on an empty stomach.
	<i>Azadirachta indica</i>	Meliaceae	Leaf	Young leaves are eaten daily in the morning.
	<i>Phyllanthus acidus</i>	Euphorbiaceae	Fruit	2 spoon fruit powder with 1 glass of milk is taken twice a day.
	<i>Tinospora cordifolia</i>	Menispermaceae	Stem	1 cup of decoction is taken in the morning.
Glaucoma	<i>Euphorbia hirta</i>	Euphorbiaceae	Whole plant	Whole plant infusion used as eye drop.
	<i>Achyranthes aspera</i>	Amaranthaceae	Leaves	Consumed as leafy vegetables.
	<i>Lantana camara</i>	Verbenaceae	Leaf	Ashes of leaf is boiled with water and filter with cotton cloth. After some time, 1 drop is used.
Cardio-vascular disease	<i>Terminalia chebula</i>	Combretaceae	Bark	Bark soaked in water and taken orally.
	<i>Tephrosia purpurea</i>	Fabaceae	Whole plant	Decoction of The whole plant is taken.
	<i>Punica granatum</i>	Lythraceae	Fruit	Juice maintain blood flow for curing

				heart problem
	<i>Anacardium occidentale</i>	Anacardiaceae	Fruit	Fruit is taken directly.
	<i>Terminalia arjuna</i>	Combretaceae	Bark	Bark powder is taken in the morning on an empty stomach.
	<i>Allium sativum</i>	Liliaceae	Bulb	Half bulb juice is taken once in 2 days.
Blood pressure	<i>Rauwolfia serpentina</i>	Apocynaceae	Root	Juice is taken once a week.
	<i>Viscum album</i>	Santalaceae	Leaf	Aqueous extract of leaves is taken (rare case)
	<i>Cassia occidentalis</i>	Fabaceae	Leaf	Leaves extracts is taken in diluted form.
	<i>Cuscuta reflexa</i>	Convolvulaceae	Whole plant	Aqueous infusion of whole plant is taken.
	<i>Moringa oleifera</i>	Moringaceae	Leaf	Leaves are consumed as a leafy vegetables.
	<i>Phyllanthus amarus</i>	Euphorbiaceae	Leaf	Decoction of the leaves is taken in the morning.
Renal failure	<i>Aerva lanata</i>	Amaranthaceae	Aerial parts	Consumed as leafy vegetables.
	<i>Bauhinia variegata</i>	Fabaceae	Tender leaf	Consumed as leafy vegetables.
	<i>Carica papaya</i>	Caricaceae	Fruit	Fruits are used raw or cooked.
	<i>Tectona grandis</i>	Lamiaceae	Bark	Infusion of bark is taken orally.
	<i>Mimosa pudica</i>	Mimosaceae	Leaf	Consumed as leafy vegetables.
	<i>Phyllanthus niruri</i>	Phyllanthaceae	Whole plant	Consumed as leafy vegetables.
Parkinson's disease	<i>Bacopa monnieri</i>	Plantaginaceae	Whole plant	Consumed as leafy

				vegetables.
	<i>Centella asiatica</i>	Apiaceae	Whole plant extract	Consumed as leafy vegetables.
	<i>Evolvulus alsinoides</i>	Convolvulaceae	Whole plant	Decoction of whole plant.
	<i>Murraya koenigii</i>	Rutaceae	Leaf	Consumed as spices. .
	<i>Sida cordifolia</i>	Malvaceae	Root powder	Decoction of root powder.
Osteoporosis	<i>Punica granatum</i>	Lythraceae	Fruit	Juice of fruit peel.
	<i>Asparagus racemosus</i>	Asparagaceae	Leaf	Leaf juice is taken orally.
	<i>Cissus quadrangularis</i>	Vitaceae	Stem	Stem juice is taken orally.
	<i>Erythrina variegata</i>	Fabaceae	Flower	Infusion of flower mixed with honey and taken orally.
	<i>Withania somnifera</i>	Solanaceae	Root	Decoction is taken orally.
	<i>Dioscorea alata</i>	Dioscoreaceae	Tuber	Tubers are cooked with pulses and consumed regularly.
Flu	<i>Ocimum sanctum</i>	Lamiaceae	Leaf	Juice of leaves is taken twice a day to control flu
	<i>Embelica officinalis</i>	Phyllanthaceae	Fruit	Fruit juice is taken to control the flu.
	<i>Zingiber officinale</i>	Zingiberaceae	Rhizome	Used in the form of a hot tea or ground up in meals
	<i>Aegle marmelos</i>	Rutaceae	Fruit	Its regular use builds up resistance to colds and coughs.
	<i>Mentha piperita</i>	Lamiaceae	Leaf	The juice of leaves is taken orally.
Cataract	<i>Alangium salvifolium</i>	Cornaceae	Leaf	Leaves are mixed with leaves of <i>Amaranthus viridis</i> and made juice.

				The juice is taken regularly.
	<i>Cassia fistula</i>	Fabaceae	Fruit pulp	Fruit pulp decoction is taken once a week.
	<i>Coffea arabica</i>	Rubiaceae	Seed	Seed decoction is taken orally.
	<i>Cyanthillium cinereum</i>	Asteraceae	Leaf	Leaves are consumed as a leafy vegetables.
	<i>Moringa oleifera</i>	Moringaceae	Leaf	Leaves are consumed as a leafy vegetables.
Pneumonia	<i>Alstonia scholaris</i>	Apocynaceae	Bark	Bark decoction is taken orally
	<i>Clerodendrum viscosum</i>	Lamiaceae	Root	Root decoction is taken orally
	<i>Leucas aspara</i>	Lamiaceae	Leaf	Leaves are consumed as a leafy vegetables.
	<i>Nyctanthes arbor - tristis</i>	Oleaceae	Leaf	Leaf decoction is taken orally thrice till cure.
	<i>Oroxylum Indicum</i>	Bignoniaceae	Bark	Bark decoction is taken orally thrice till cure.

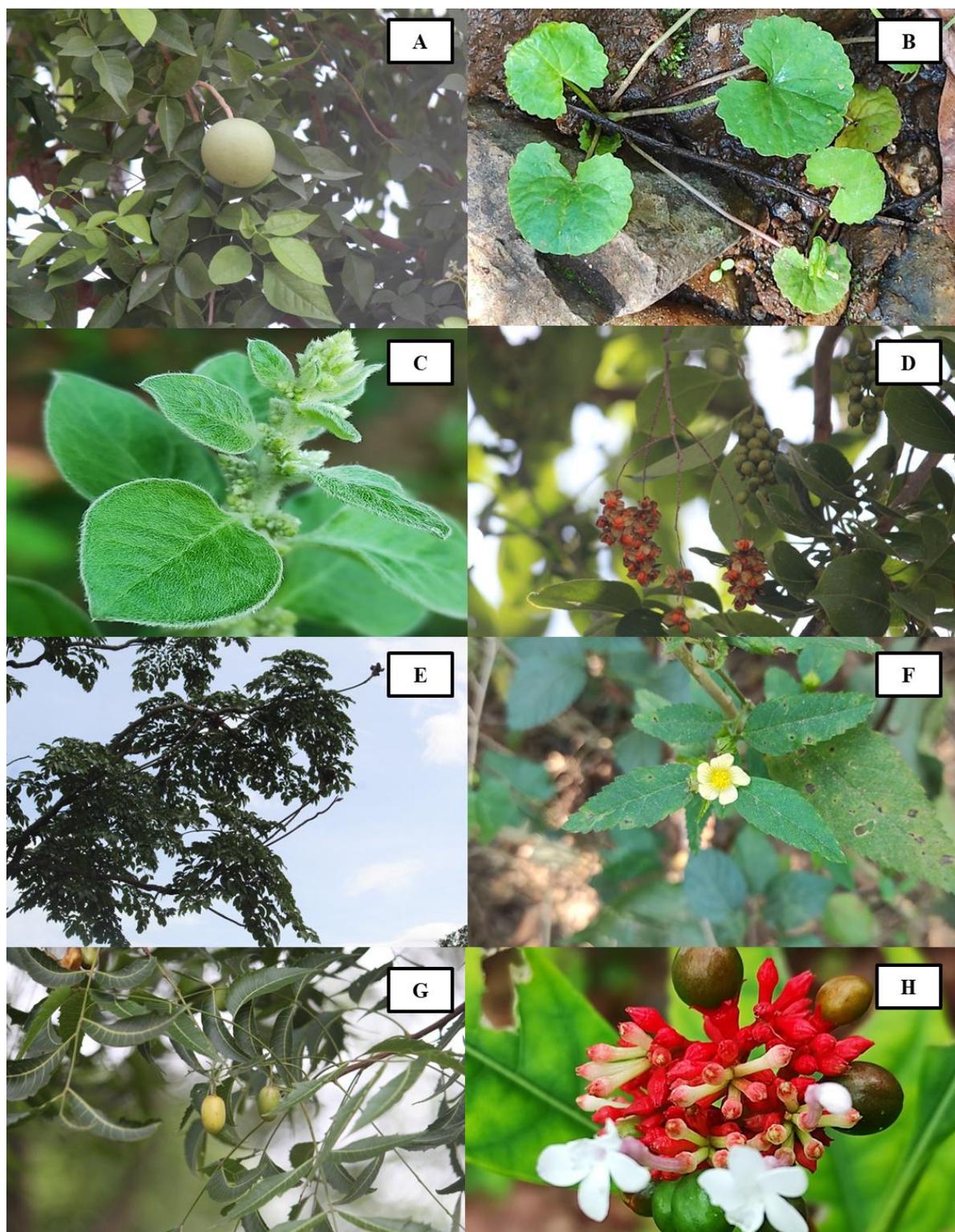


Plate 2: Plants used in some common old age problems A) *Aegle marmelos*, B) *Centella asiatica*, C) *Aerva lanata*, D) *Celastrus paniculatus*, E) *Oroxyllum indicum*, F) *Sida acuta*, G) *Azadirachta indica*, H) *Rauvolfia serpentina*

The local people use to manage their health problems at home by using these different plant species found around them. Details are listed in [Table 1](#) & [Plate 2](#). Many researchers have documented ethnomedicinal plants but less reports are available on plants used in old age problems. In [2008](#), Central Council for Research

in Ayurveda and Siddha published a book entitled "Medicinal plants in Geriatric Health Care: an evidence based approach" and discussed on plants used related to old-age problems. In the year 2018, Adib et al. reported the medicinal plants used by the elderly people of Iran whereas in 2013, Natarajan et al. reported 40 herbal remedies used in health problems related to old-age people.

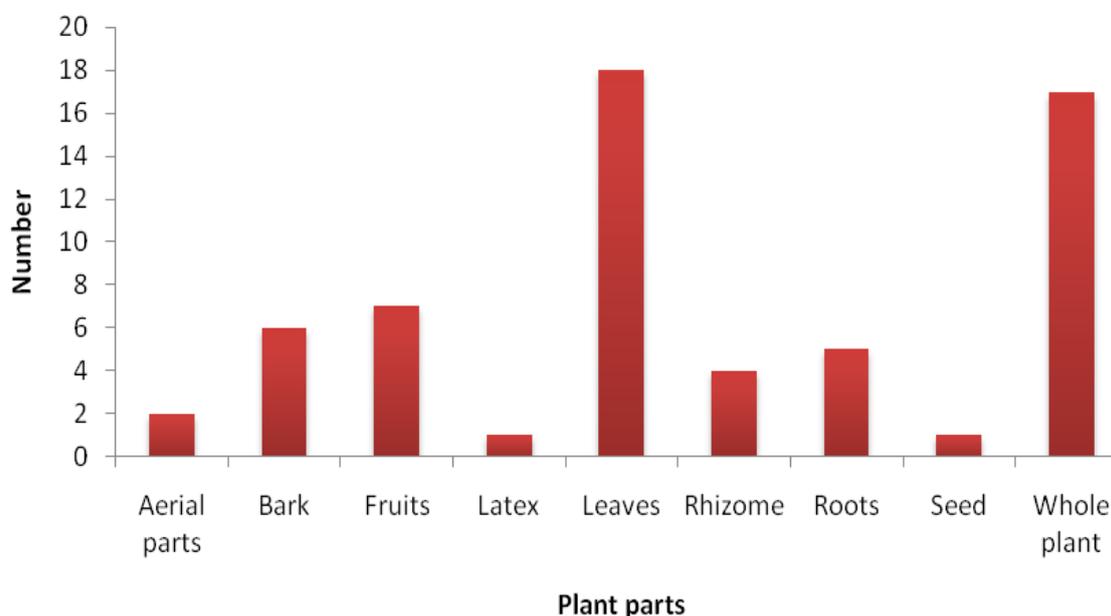


Figure 2: Uses of plant parts in old-age problems

CONCLUSION

The use of medicinal plants dates back to the earliest times of humanity. Most of the pharmaceutical products currently used by the physicians possess a history of herbal medicine where active compounds isolated from plants are utilized pharmaceutically. Since herbal medicine does not strictly adhere to scientific approach, it is considered as 'alternative medicine'. The current ethno-botanical study provides the practical evidence about the uses of medicinal plant species among old age people. However, the number of studies is limited in this aspect and we recommend that further studies to be conducted to confirm reported activities of these medicinal plants. By this report, it can be concluded that in the core of nature there are so many plants which are potential against many diseases and disorders not only related to old age problems but also for other diseases. Herbal medications are free from side effects and toxicity unlike the allopathic medicines which can be a better option for elderly people.

ACKNOWLEDGEMENT

Authors are thankful to the forest officials of Odisha state and local communities. Authors are also thankful to the DFO, Bonai & DFO Raiangpur and team members of APRF, Odisha.

REFERENCES

- Abdelkader H, Alany RG and Pierscionek B. Age-related cataract and drug therapy: Opportunities and challenges for topical antioxidant delivery to the lens. *Journal of Pharmacy and Pharmacology*. 2015; 67:537-50.
- Adib HM and Rafiee S. Medicinal plants use by elderly people in Kashan, Iran. *Nursing and Midwifery Study*. 2018; 7:67-73.
- Amani R and Sharifi N. (2012). Cardiovascular Disease Risk Factor, Cardiovascular System. Fourteenth edition. IntechOpen. Iran.
- Bhushan I, Kour M, Kour G, Gupta S, Sharma S and Yadav A. Alzheimer's disease: Causes & treatment—A review. *Annals of Biotechnology*. 2018; 1(1):1002.
- Bindroo S, Quintanilla Rodriguez BS, Challa HJ. (2020). Renal Failure. In *Treasure Island (FL)*. StatPearls, US.
- Breijyeh Z and Karaman R. Comprehensive Review on Alzheimer's Disease: Causes and Treatment. *Molecules*. 2020; 25(24):5789. doi: 10.3390/molecules25245789.
- Choubey A, Kalia RK, Malmstadt N, Nakano A and Vashishta P. Cholesterol translocation in a phospholipid membrane. *Biophysical Journal*. 2013; 104(11):2429-2436.
- DeMaagd G and Philip A. Parkinson's Disease and Its Management: Part 1: Disease Entity, Risk Factors, Pathophysiology, Clinical Presentation, and Diagnosis. 2015; 40(8):504-532.
- Ferdous H, Afsana F, Qureshi N and Rouf R. Osteoporosis: A review. *Birdem Medical Journal*. 2015; 5(1): 30-36.
- Foley AL, Loharuka S, Barrett JA, Mathews R, Williams K, McGrother CW and Roe BH. Association between the Geriatric Giants of urinary incontinence and falls in older people using data from the Leicestershire MRC Incontinence Study. *Age Ageing*. 2012; 41(1):35-40.
- Freitas MCD, Queiroz TA and Sousa JAV. The meaning of old age and the aging experience of in the elderly. *Revista da Escola de Enfermagem da U S P*. 2010; 44(2):403-408.
- Lal BS. (2016). Diabetes: causes, symptoms, and treatments. In *Public Health Environment and Social Issues in India (1st Edition)*, Serials Publications Editors, India.
- Lam D, Roa SK, Ratra V, Liu Y and Mitchell P. Cataract. *Nature Reviews Disease Primers*. 2015; 1(1):15014.
- Mackenzie G. The definition and classification of pneumonia. *Pneumonia*. 2016; 22:8-14.
- Medicinal Plants in Geriatric Health Care: an evidences based approach. (2008). Central Council for Research in Ayurveda and Siddha, India.
- Natarajan S, Shunmugiah KP and Kasi PD. Plants traditionally used in age-related brain disorders (dementia): an ethanopharmacological survey. *Pharmaceutical Biology*. 2013; 51(4): 492-523.
- Olokoba AB, Obateru OA and Olokoba LB. Type 2 diabetes mellitus: a review of current trends. *The Oman Medical Journal*. 2012; 27(4):269-73.
- Schellack N and Labuschagne Q. Overview and management of colds and flu. *South African Pharmaceutical Journal*. 2014; 81:19-26.

- Schellack N, Schellack G and Bezuidenhout S. Glaucoma: a brief review. South African Pharmaceutical Journal. 2015; 82:18-22.
- Senthelal S, Li J, Goyal A, Bansal P and Thomas MA. (2021). Arthritis. StatPearls, US.
- Sozen T, Ozisik L and Basaran NC. An overview and management of osteoporosis. European Journal of Rheumatology. 2017; 4(1):46-56.
- Thomas R, Kanso A and Sedor JR. Chronic kidney disease and its complications. Primary Care: Clinics in Office Practice. 2008; 35: 329-344.
- Turkbeyler IH, Ozturk ZA, Gol M, Abiyev A, Kaya B, Atakur S and Oz M. What is Geriatrics? Geriatrics or older adults health and diseases? European Journal of Geriatrics and Gerontology. 2019; 1(2):51-55.
- Unal E and Ozdemir A. (2019). Old Age and aging. In book: Recent Studies in Health Sciences. St. Kliment Ohridski University Press, Sofia, Bulgaria.
- Vande WC, Yalcin A, Aden BG, et al. (2020). HomeSense: Design of an ambient home health and wellness monitoring platform for older adults. Health Technology. 10: 1291-1309.
- WHO. (2008). The global burden of disease: 2004 update. Geneva: World Health Organization.
- Williams JS, Brown SM and Conlin PR. Blood-pressure measurement. New England Journal of Medicine. 2009; 360: 2034-2035.
- Zafar S and Yaddanapudi SS. (2021). Parkinson Disease. STATPEARLS Publishing, US.

Importance of sacred groves in conservation of medicinal plants

Paramita Ray¹, Katake Rohit Dnyanoba², Pangare Pradnya Rajesh², Kumbharkar Akanksha Dattatray² and Sanjeet Kumar^{3*}

¹Ram Krishna Dharmarth Foundation University, Ranchi, Jharkhand, India

²Waghire College of Arts, Commerce and Science, Saswad, Pune, Maharashtra, India

³Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sanjeetaprf@gmail.com

DOI:10.5281/zenodo.5939747

ABSTRACT

Sacred groves are tracts of virgin forest with rich diversity, which have been protected by the local people for centuries for their cultural and religious beliefs and taboos that the deities reside in them and protect the villagers from different calamities. Dedication of forests to a god or goddess is a potent example of an indigenous conservation practices, devised by native inhabitants to put an end to the unrestricted utilization of community forests. Keeping the importance of sacred groves, authors done survey in selected sacred groves of Odisha. The present study on medicinal plants on selected sacred groves of different districts show that, there are about 50 common plant species which are belonging to 45 genera possess various medico potentialities for curing many ailments. The local people who conserve these groves and they are also having a very good knowledge of such medicinal plants. The present paper describes the studies on some sacred groves highlighting the medicinal plants associated with the sacred groves, which could provide a powerful tool for ensuring biodiversity conservation through community participation.

Keywords: Sacred groves, indigenous community, medicinal plants, traditional therapeutic practices

INTRODUCTION

Sacred groves are segment of landscapes containing trees and other forms of life and geographical features that have been preserved by the ethnic communities based on their religious beliefs (Jagdale 2021; Ray *et al.*, 2014). Sacred groves are locally known with various names like Kavu (in Malayalam), Sindhravana or Pavithravana, Devarkadu (in Kannada), Deoban or Devraj (in Marathi), Orans (in Rajasthan), Sarpakadu (in Tamil) are religiously protected forests (Deepa *et al.*, 2016). The concept of sacred groves is very old and has existed since the time of Rig-Veda (an ancient Indian sacred collection of Vedic Sanskrit hymns), when tree worship was quite popular and universal. Buddha's study and enlightenment was also with a Banyan tree (Negi 2005). Historically, indigenous people throughout the world in general and India in particular, with the inheritance of traditional and cultural legacy were protecting the sacred groves and other natural resources with the practice of nature worship (Chanda and Ramachandra 2019). Since time immemorial, the local communities, mostly tribal depends in these groves for traditional medicines to cure different diseases (Chanda and Ramachandra 2019; Duggal *et al.*, 2017). Sacred groves are believed to be a treasure house of rare endangered, threatened and endemic species which are unharmed and protected by the local peoples due to the belief on the deities of the forest (Yadav *et al.*, 2010). It also plays an important role in the balancing of our ecosystem like cleaning environment, that is, air, soil, and water conservation, conservation of flora &

fauna, carbon sequestration, temperature control, and conservation of traditional knowledge and also serves as a home for birds and small mammals, and hence they indirectly help in the conservation of biodiversity (Singh *et al.*, 2017). It has been observed that several medicinal plants that are not to be found in the forest are abundant in the sacred groves. The concept and beliefs of sacred trees and groves of forests are one of the best practices to conserve the natural resources (Khan *et al.*, 2008; Kandari *et al.*, 2014). Since most of the groves are located near human settlements, with the passage of time, human disturbances increasing progressively on them creating considerable changes in the extent of the sacred groves, in their vegetation structure, peoples' perception towards them and the religious beliefs and taboos but some of the sacred groves are still undisturbed but majority is in different stages of degradation. Therefore, a holistic understanding of the current status, structure and function of sacred grove is essential for assessing their ecological role and formulating strategies for their conservation (Khan *et al.*, 2008; Deepa 2016). The present paper presents a case study of some sacred groves of Odisha in some selected districts and the aim of the study was to document the tradition of sacred groves could protect many indigenous as well as medicinal plants for ensuring biodiversity conservation through community participation.

METHODOLOGY

A preliminary survey was conducted in different sacred groves of Kapilash (Dhenkanal), Rairangpur Forest Division (Mayurbhanj), Mahanadi River Basin (Cuttack) to evaluate the status of biodiversity, different myths and beliefs associated with them and their role in the biodiversity conservation. Twenty sacred groves were selected for the study. Each grove was visited during different seasons from 2019 to 2021, analysed the floristic composition. Plants were identified by Dr. Sanjeet Kumar, CEO, Ambika Prasad Research Foundation, India with the help of literature (Saxena and Brahman 1995). Data was gathered from the local participants, especially from elderly people through semi-structured questionnaires. The information collected included the general information regarding the sacred groves and the associated deity, floral diversity and the ethnomedicinal property of different plants as well as their socio-cultural, ecological, economical and food values (Plate 2-3).

RESULTS AND DISCUSSION

Sacred grove plays a major role to recognize and conserve the biodiversity traditionally. A total of 50 plant species (40 trees, 6 herbs, 1 grass and 2 climber) belonging to 45 genera were recorded as sacred plants from the study areas. The most common worshiped plant species recorded are *Ficus benghalensis*, *Ficus religiosa*, *Phyllanthus emblica*, *Aegle marmelos* etc. Study areas are rich with many medicinal plant species like *Adrographis paniculata*, *Azadirachta indica*, *Celastrus paniculatus*, *Terminalia bellirica*, *Saraca asoca*, *Rauwolfia serpentine*, *Terminalia elliptica*, *Mesua ferrea* etc. We found some culturally important plant species like *Achyranthes aspera*, *Couroupita guianensis*, *Cynodon dactylon* etc. Economically important plant species like *Buchanania lanzan*, *Madhuca longifolia*, *Mangifera indica*, *Shorea robusta* etc. We have also documented plant species with food values

found in study areas like *Mangifera indica*, *Syzygium cumini*, *Buchanania lanzan* etc. According to the indigenous communities associated with the sacred groves they use various medicinal plants in many diseases and disorders like decoction of leaves of *Adrographis paniculata* is taken 2 times in empty stomach against malaria and stomach pain; leaf paste is also used externally in skin infections. They use Bahada or *Terminalia bellirica* fruits against cough and also collect the fruits and sell in the local market. Seed oil of *Celastrus paniculatus* is used on joints against rheumatic pain. *Syzygium cumini* fruits are consumed by them raw to treat diabetes also the fruits are collected and sell in market. Leaf decoction of *Aegle marmelos* helps in treating fever and the fruit juice is used for cooling and also against stomach problems (Table 1; Plate 1).

Table 1: Commonly available medicinal plants in selected sacred groves of study area

Botanical Name	Medicinal	Socio-cultural	Economical	Food
<i>Achyranthes aspera</i>	✓	✓		✓
<i>Adrographis paniculata</i>	✓		✓	✓
<i>Aegle marmelos</i>	✓	✓	✓	✓
<i>Alstonia scholaris</i>	✓			
<i>Azadirachta indica</i>	✓	✓	✓	✓
<i>Bombax ceiba</i>	✓			
<i>Buchanania lanzan</i>	✓		✓	✓
<i>Butea monosperma</i>	✓	✓	✓	
<i>Careya arborea</i>	✓			
<i>Cassia fistula</i>	✓	✓	✓	
<i>Celastrus paniculatus</i>	✓		✓	
<i>Couroupita guianensis</i>	✓	✓		
<i>Crateva magna</i>	✓	✓		✓
<i>Curculigo orchoides</i>	✓		✓	
<i>Ichnocarpus frutescens</i>	✓		✓	
<i>Cynodon dactylon</i>	✓	✓		
<i>Dalbergia sissoo</i>	✓		✓	
<i>Diospyros melanoxylon</i>	✓		✓	✓
<i>Bauhinia vahlii</i>	✓	✓	✓	✓
<i>Elephantopus scaber</i>	✓			
<i>Ficus benghalensis</i>	✓	✓		
<i>Ficus racemosa</i>	✓			✓
<i>Ficus religiosa</i>	✓	✓		
<i>Holarrhena pubescens</i>	✓			
<i>Madhuca longifolia</i>	✓		✓	✓
<i>Magnolia champaca</i>	✓	✓		
<i>Mangifera indica</i>	✓	✓	✓	✓
<i>Mesua ferrea</i>	✓	✓		
<i>Millettia pinnata</i>	✓		✓	

<i>Mimusops elengi</i>	✓			✓
<i>Neolamarckia cadamba</i>	✓	✓		
<i>Phyllanthus emblica</i>	✓	✓	✓	✓
<i>Pithecellobium dulce</i>	✓			✓
<i>Prosopis cineraria</i>	✓	✓		
<i>Pterocarpus marsupium</i>	✓			
<i>Rauwolfia serpentina</i>	✓		✓	
<i>Santalum album</i>	✓	✓	✓	
<i>Saraca asoca</i>	✓	✓		
<i>Schleichera oleosa</i>	✓			✓
<i>Shorea robusta</i>	✓	✓	✓	
<i>Sterculia foetida</i>	✓			
<i>Sterculia urens</i>	✓			
<i>Streblus asper</i>	✓			✓
<i>Strychnos nux-vomica</i>	✓			
<i>Syzygium cumini</i>	✓		✓	✓
<i>Terminalia bellirica</i>	✓		✓	
<i>Terminalia elliptica</i>	✓			
<i>Terminalia phillyreifolia</i>	✓	✓		
<i>Vanda tessellata</i>	✓			
<i>Xylocarpa</i>	✓			

Ethno-floristic survey was done in many sacred groves throughout the globe. Mohanta *et al.*, in 2012, documented the state of 13 Sacred Groves in Balasore, Odisha. A total of 58 floral species and 13 faunal species were recorded. In Balasore, Sacred Groves are small in size and can act as starting points for any long term conservation plan of biodiversity. In 2014, Panda *et al.* reported 94 plant species from the sacred groves of Koraput district distributed in 63 genera belonging to 43 different families. Most of the vegetation is mainly consists of *Azadiracta indica*, *Ficus racemosa*, *Ficus religiosa*, *Bombax ceiba*, *Artocarpus heterophyllus*, *Mangifera indica*, *Diospyros malabarica*, *Acacia nilotica*, *Pterocarpus marsupium* etc. In 2015, Behera and Pradhan studied the overall biodiversity of sacred groves in Phulbani Forest division, Odisha and found 48% are trees, 32% shrubs, 14% herbs and 6% climbers. They found trees like Banyan (*Ficus benghalensis*), Peepal (*Ficus religiosa*), Sal (*Shorea robusta*), Rohini (*Somida febrifusa*) and Aam (*Mangifera indica*) worshipped by the local people in the sacred grove areas. Mohanty *et al.*, (2016) and Kumar *et al.*, (2016) also reported the importance of sacred groves and discussed the role in conservation of medicinal plants. In 2019, Panda and Mund carried out a survey on sacred groves in the village Sargiguda of Kalahandi district as to collect the information regarding the role and potential of sacred groves and recorded a total of 48 plant species belonging to 33 different families. Fabaceae family members were found dominant in these sacred groves. Panda *et al.*, in 2020 documented a total of 42 plant species belonging to 39 genera under 26 families with different life forms.

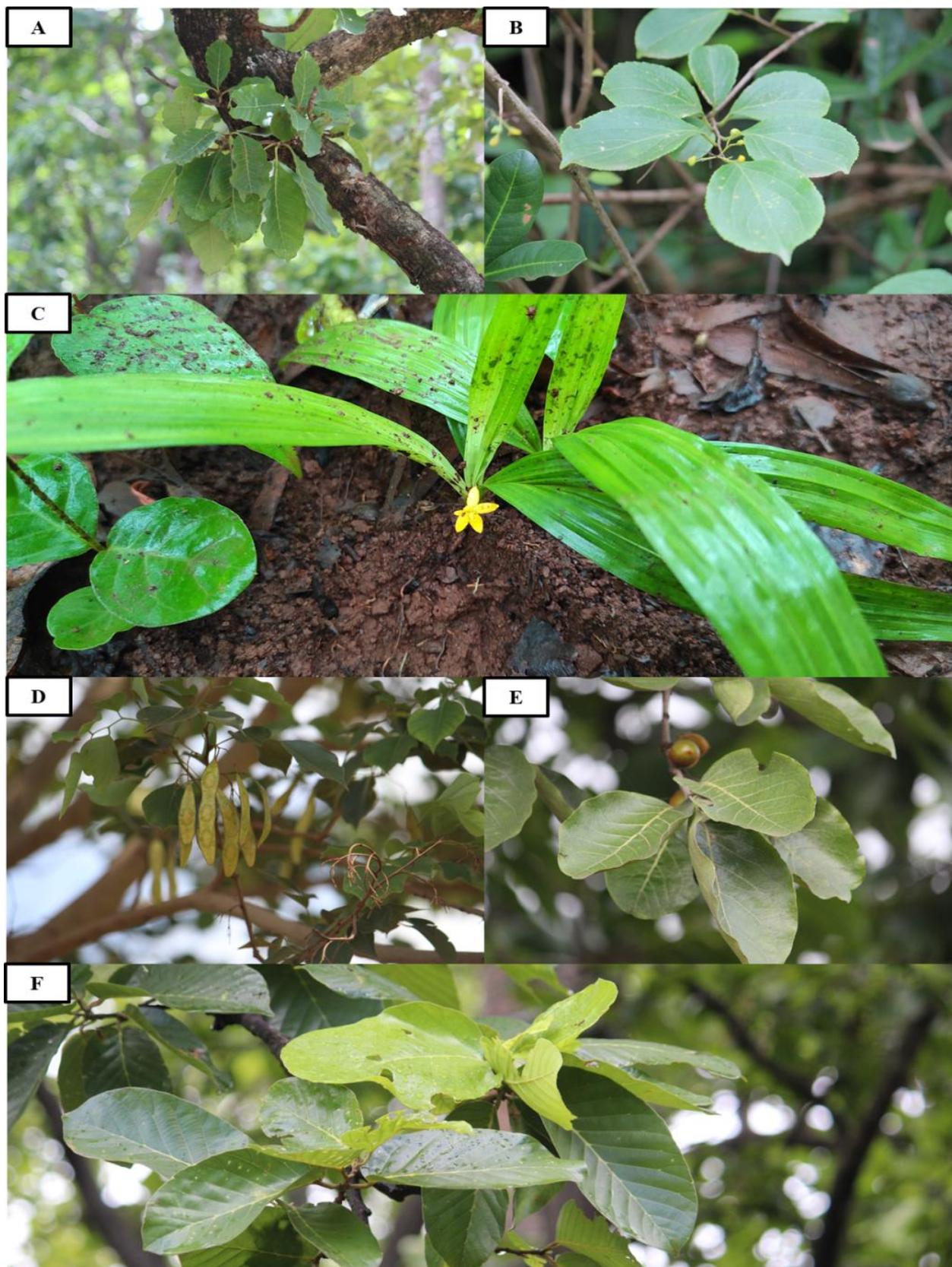


Plate 1: Some common plants found in Sacred Groves A) *Madhuca longifolia*, B) *Celastrus paniculatus*, C) *Curculigo orchiodes*, D) *Dalbergia sissoo*, E) *Diospyros melanoxylon*, F) *Shorea robusta*

Members of family Moraceae (5 spp.) were found to be the most represented among all the species followed by Caesalpiniaceae (4 spp.) and Fabaceae (3 spp.) respectively. Different species of *Ficus* were predominantly present in most of the sites.



Plate 2: Survey works in different sacred groves of study areas

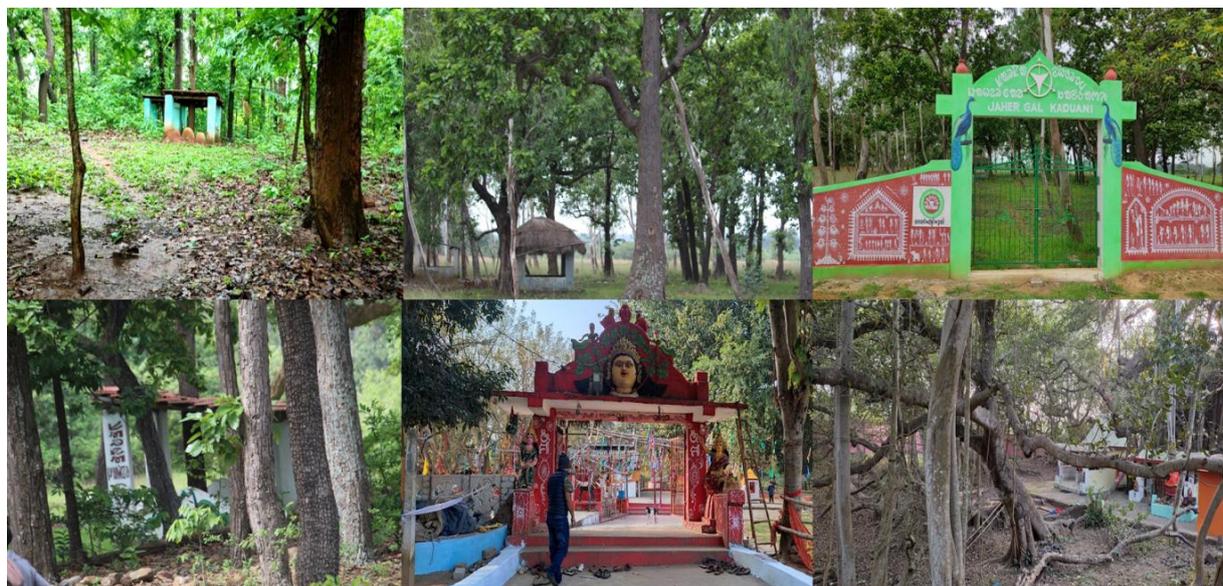


Plate 3: Important sacred groves of study areas

CONCLUSION

Sacred Groves are not only the important repositories of ethno-medicinal plant species, but also act as an important element of biological diversity and rich in floras and faunas. In some groves more importance is given to temples than forests. Mainly its conservation is community based and under religious faith. However, in recent times, the Sacred Groves are threatened by uncontrolled and unplanned developmental activities, as well as invasive species, land use change, population

growth and socio-cultural change. Through the present study we hope to convey that, the various plants, which are documented from the study area, are also an important factor for the contribution to the biodiversity of the existing area and it also adds to the knowledge of traditional medicine which has a higher scope in future.

ACKNOWLEDGEMENT

Authors are thankful to the Divisional Forest Officer (DFO), Raiangpur & Dhenkanal Forest Divisions. Authors are also thankful to the local communities and team members of APRF, Odisha.

REFERENCES

- Behera MK and Pradhan TR. Sacred groves of Phulbani Forest Division of Odisha: socio cultural elements and plant biodiversity. *Indian Forester*. 2015; 141 (6): 670-673.
- Chanda S and Ramchandra TV. Vegetation in the Sacred Groves Across India: A Review. *Research & Reviews: Journal of Ecology*. 2019; 8(1):29-38.
- Deepa MR, Sheema DP and Udayan PS. Floristic diversities and medicinal importance of selected sacred groves in Thrissur district, Kerala. *Tropical Plant Research*. 2016; 3(1): 230-242.
- Duggal RR, Masih SK and Mishra RP. Biodiversity conservation through religious believes in sacredGroves of Jabalpur forest division (Madhya Pradesh). *International Journal of Agricultural Science and Research*. 2017; 7(3):189-196.
- Jagdale PE. Role of Sacred Groves in Conservation of Biodiversity. *International Journal of Emerging Technologies and Innovative Research*. 2021; 8(9):721-728.
- Kandari LS, Bisht VK, Bhardwaj M and Thakur AK. Conservation Management of Sacred Groves, Myths and Beliefs of Tribal Communities: A Case Study from North-India. *Environmental Systems Research*. 2014; 3:16. DOI: 10.1186/s40068-014-0016-8.
- Khan ML, Khumbongmayum AD and Tripathi RS. The Sacred Groves and Their Significance in Conserving Biodiversity: An Overview. *International Journal of Ecology and Environmental Sciences*. 2008; 34: 277-291
- Kumar S, Das PK and Jena PK. Sacred groves of Odisha: role n conservation of floral wealth. *Sabujima*. 2016; 24: 7-9.
- Mohanta RK, Adhikari BS, Sahu HK and Swain KK. The biological values and conservation status of sacred groves in the Balasore Wildlife Division, Odisha: a case study. *International Journal of Conservation Science*. 2012; 3(3): 207-216.
- Mohanty S, Das PK and Kumar S. (2016). Role of sacred groves in the conservation of traditional values of Odisha. *Advances in Plants and Agricultural Research*. 3(3): 56-58.
- Negi CS. Socio-cultural and ethnobotanical value of a sacred forest, Thal Ke Dhar, Central Himalaya. *Indian Journal of Traditional Knowledge*. 2005; 4:190-198.
- Panda BK and Mund B. A study of sacred grove of a village sargiguda inKalahandi, Odisha. *Journal of Medicinal Plants Studies*. 2019; 7(4): 266-268.
- Panda D, Bisoi SS and Palita SK. Floral Diversity Conservation through Sacred Groves in Koraput District, Odisha, India: A Case Study. *International Research Journal of Environment Sciences*. 2014; 3(9): 1-5.
- Panda T, Mishra N, Pradhan BK, Rahimuddin S and Mohanty R. Sacred groves in conservation of biodiversity in Odisha. *Holistic Approach Environment*. 2020; 10(1): 10-15.

- Ray R, Chandran MDS and Ramachandra TV. Biodiversity and ecological assessments of Indian sacred groves. *Journal of Forestry Research*. 2014; 25: 21–28.
- Saxsena HO and Brahmam M. (1995). The flora of Orissa: Orissa Forest Development Corporation Ltd. and Regional Research Laboratory, Bhubaneswar.
- Singh S, Youssouf M, Malik ZA and Bussmann RW. Sacred groves: myths, beliefs, and biodiversity conservation—a case study from Western Himalaya, India. *International Journal of Ecology*. 2017; 1-12.
- Yadav S, Yadav JP, Arya V and Panghal M. Role of sacred groves in conservation of plant biodiversity in Mahendergarh District of Haryana. *Indian Journal of Traditional Knowledge*. 2010; 9(4): 693-700.

Medicinally important terrestrial parasitic plants

Nidhi Mahendru¹, Melakau Masresha², Pallavi Joshi³, Sugimani Marndi⁴ and Sanjeet Kumar^{4*}

¹ Kanya Maha Vidyalaya, Jalandhar, Punjab, India

² School of Applied Sciences, KIIT University, Odisha, India

³ High Altitude Plant Physiology Research Centre, Hemvati Nandan Bahuguna Garhwal University, Srinagar, Uttarakhand, India

⁴ Biodiversity and Conservation Lab. Ambika Prasad Research Foundation, Odisha, India

Email Id: sanjeetaprf@gmail.com

DOI: 10.5281/zenodo.5976089

ABSTRACT

Parasitic plants are the keystone species in the ecological restorations as they help in coexistence of species. Intense research works in the recent years on parasitic plants have shown affirmative effects on biodiversity. Indigenous parasitic plants have medicinal importance however medicinal values of these parasitic plants is still one of the under studied area. Parasitic plants, contain diverse secondary metabolites which are potent against many vital diseases. In this study, we documented some such medicinally important terrestrial parasitic plants. Ethnobotanical survey was carried out using semi structured questionnaire and Passport Data Form in Odisha state, India. As a result, we found 10 terrestrial parasitic plants having medicinal values and used against various diseases and disorders. Present study further highlights the added value of traditional medicinal parasitic plants for health care.

Keywords: *Terrestrial Parasitic plants, Medicinal uses, Diseases*

INTRODUCTION

Parasitic plants are diverse group of plants which obtain all or part of its nutrition from another plant (the host) without contributing to the benefit of the host. The operational feature of a parasitic plant is the haustorium, a specialized organ that penetrates the host and forms a vascular unification between the plants (Press and Phoenix 2005; Musselman and Press 1995). All parasitic plant species are angiosperms found in all climatic regions and continents of the world excluding Antarctica (Eizenberg and Goldwasser 2018). Parasitic plants have evolved from non-parasitic plants and thus underwent an evolutionary transition from autotrophy to heterotrophy. Hemi-parasites have the ability to photosynthesize as they rely on their hosts for water and mineral nutrients. On the other hand, holoparasites are non-photosynthetic and depend on their hosts for all nutrition (Sahu et al., 2018). In 21st century, the systematic data generated made these parasitic plants a vital research component of bio-diverse ecosystems and it could further reveal their applications for applied research (Bouwmeester et al., 2021). The negative effects of parasitic plants on their host and their further knowledge has contributed to indigenous bio-cultural knowledge. However, traditional uses of parasitic plants for their medicinal properties is known but there are few written evidences throughout the world. The present study has brought up into the notice about the role of parasitic plant species in the health care systems.

METHODOLOGY

During the months of September 2020 and May 2021, an ethnobotanical study was conducted in different parts of Odisha (Plate 1). The Passport Data Form (PDF) is used to gather the information about the medicinal values of terrestrial parasitic plants. The species are identified by Dr Sanjeet Kumar the CEO of Ambika Prasad Research Foundation, Odisha.

RESULTS AND DISCUSSION

During present study, 10 terrestrial parasitic plants are documented for their medicinal values. The enumerated species found during survey are *Aeginetia indica*, *Aeginetia pedunculata*, *Balanophora polyandra*, *Centranthera indica*, *Centranthera tranquebarica*, *Orobanche aegyptiaca*, *Orobanche cernua*, *Striga angustifolia*, *Striga densiflora*, and *Striga gesnerioides*. Maximum parasitic plants used for medicinal purposes were from the family Scrophulariaceae and Orobanchaceae (Table 1; Plate 1). These species were used against diseases like skin infection, wound healing, diuretic and as appetizers. *Aeginetia indica*, *Aeginetia pedunculata*, *Centranthera tranquebarica* are used to treat skin infection. *Orobanche aegyptiaca* flower is mainly used to enhance appetite. *Striga angustifolia* and *Striga densiflora* are mostly used for the wound in cattle. These traditional herbal therapeutic remedies are the oldest forms of healthcare and are still maintained and add to great traditional knowledge (Jaiswal *et al.*, 2021). Researchers documented terrestrial parasitic plant in all over the world. Jaradat *et al.*, (2021) reported use of *Orobanche aegyptiaca*, internally to treat infectious diseases as well as its external use helps in the wound healing process. In 2020, Tlau and Lalawmpuii stated that *Aeginetia indica* has many medicinal uses. In 2021, Raja *et al.* documented *Striga angustifolia* has antimicrobial activity. The phytochemical and pharmacological studies worldwide on parasitic plants have also revealed medicinal properties (Lim *et al.*, 2016), but the still biodiverse knowledge of parasitic plants, data gaps are to be evaluated and documentation against broad range of diseases. The present study highlights on the terrestrial parasitic plants used traditionally in Eastern Ghats, their well documentation and analyses for the medicinal purposes.

Enumeration of Terrestrial Parasitic Plants

Aeginetia indica

Annual herb. It is a gregarious root holoparasite. It found in shaded forest floor covered with leaf litter. It has a slender fleshy fibrous root. Leaves are absent. Flower is solitary on a slender erect, 15-25 cm tall, crimson purple in colour. Corolla tubular, curved. Host species are *Oryza sativa*, *Zea mays* and *Saccharum officinarum*.

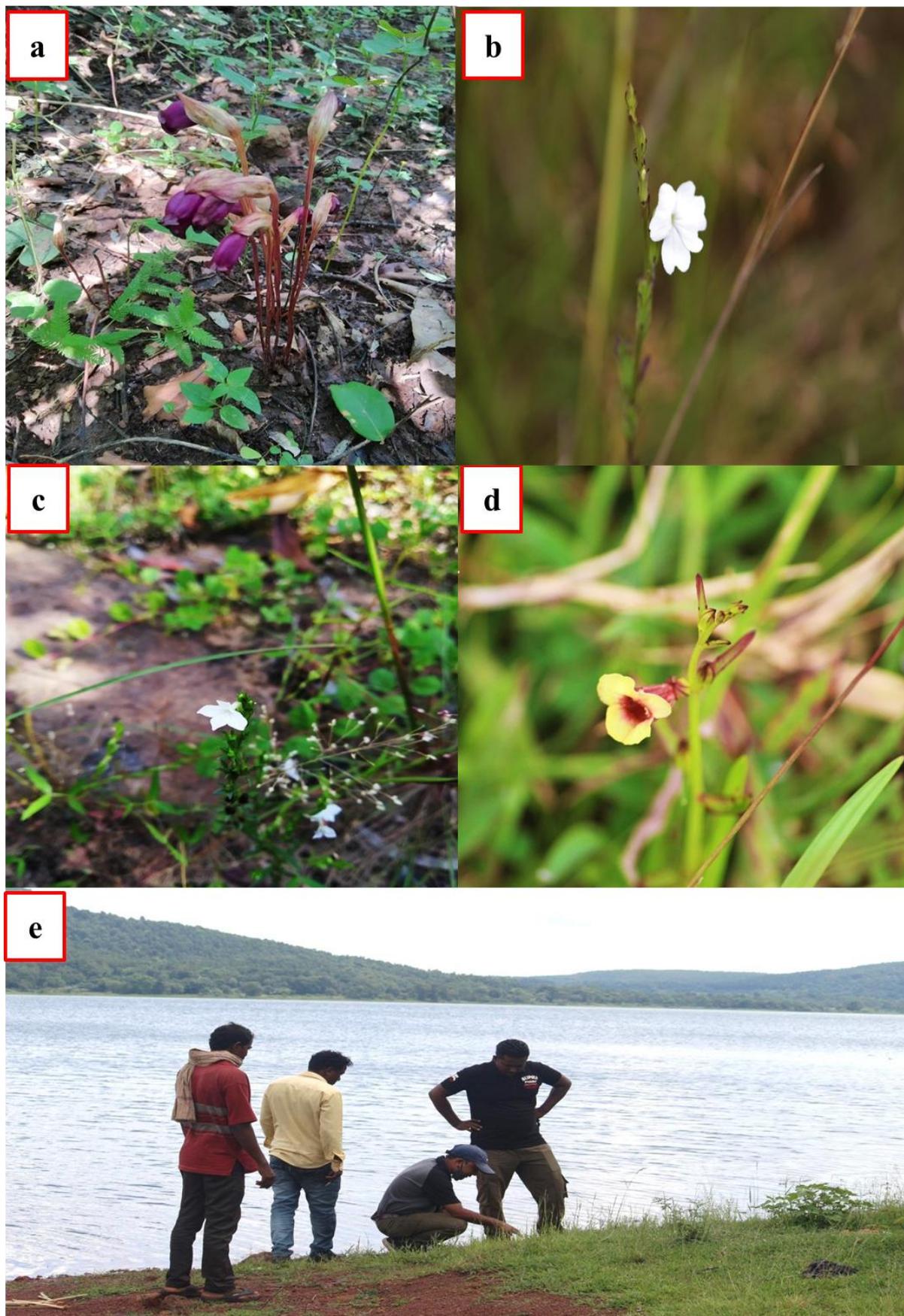


Plate 1 : Some terrestrial parasitic plants. a) *Aeginetia indica* b-c) *Striga densiflora* d) *Centranthera tranquebarica* e) Field survey

Aeginetia pedunculata

Annual herb. It is root holoparasite plant. It is found in agricultural field. Leaves are absent. Flower is violet or bluish petals, tube about as long as the calyx. Host species are *Sorghum bicolor*, *Oryza sativa*, *Zea mays*.

Balanophora polyandra

It is a holoparasite herb. Plant root is tuberous. It grows on roots of tree in leaf litter under shade. Leaves decussate whorled, obovate to broadly oblong. Flower is a solitary stipitate fusiform ovary with a hair like style.

Centranthera indica

Annual herb. It grows in damp area. Leaves are in distant pairs, sessile, alternately arranged on stem. Flower is rose coloured and funnel shaped.

Centranthera tranquebarica

Annual herb. It found in grassland. Leaves are linear, sessile, opposite below, and glabrous. Flowers are sub-sessile, solitary, dorsally dull purple, ventrally yellowish.

Orobanche aegyptiaca

It is a root holoparasitic plant. Annual herb. It found in light texture. Flower is blue color, arranged in spikes, sessile, anthers minutely spurred. Host plants are *Nicotiana tabacum*, *Solanum lycopersicum*, and *Helianthus annuus*, *Brassica oleracea*, *Phaseolus vulgaris*, and *Brassica nigra*.

Orobanche cernua

It is a root holoparasitic plant. Annual herb. It is found in light texture. Corolla tube pale yellow or dark blue-purple, distinctly enlarged. Host plants are cabbage, bell pepper and tobacco.

Striga angustifolia

Annual herb. Erect stem, simple or branched. Leaves are linear, upper leaves are smaller. Flowers are white, long, and white in terminal lax bracteates spikes.

Striga densiflora

It is a hemiparasite plant. Annual herb. It found in moist area. Leaf blade linear about 1 cm. Flower is white in colour and long, appears in lax spikes at branch ends. Host plant is root of sugarcane.

Striga gesnerioides

It is a root hemiparasite. It is usually found on agricultural area or sandy soil. It parasitic root are tuberous. It has small leaves like scales with dark reddish purple. Flower is pink in colour, Flower tube is 1cm long and curved. Presence of haustorium attached on its host roots (*Vigna unguiculata*).

Table 1: Medicinally terrestrial parasitic plant

Botanical name	Family	Vernacular name	Medicinal uses
<i>Aeginetia indica</i>	Orobanchaceae	Forest ghost flower	The flower paste is used against scabies.
<i>Aeginetia pedunculata</i>	Orobanchaceae	Yellow ghost flower	Flower paste used against fungal infection
<i>Balanophora polyandra</i>	Balanophoraceae	NIL	It is used to treat gonorrhoea
<i>Centranthera indica</i>	Scrophulariaceae	Indian spur-anther flower	Whole plant is used against diuretic
<i>Centranthera tranquebarica</i>	Scrophulariaceae	Tranquebar spur anther flower	Bacterial skin infection
<i>Orobanche aegyptiaca</i>	Orobanchaceae	Egyptian broomrape	The flower is used to make the tonic and to enhance the appetite
<i>Orobanche cernua</i>	Orobanchaceae	Nodding broomrape	Flowers are used to make the tonic.
<i>Striga angustifolia</i>	Scrophulariaceae	Narrow leaved witchweed	It is used against wound in cattle.
<i>Striga densiflora</i>	Scrophulariaceae	Dense flower witchweed	It is used against wound in cattle.
<i>Striga gesnerioides</i>	Scrophulariaceae	Purple witchweed	Wound healing

CONCLUSION

Terrestrial parasitic plants are regarded as important factors for terrestrial ecosystems and for its restorations. However, the traditional knowledge of parasitic plants along with its intense research could pave for the treatment against various diseases. In particular, our study incorporates parasitic plants that are beneficial and this documentation would help in unravelling further benefits through research of these parasitic plants

REFERENCES

- Bouwmeester H, Sinha N and Scholes J. Parasitic plants: physiology, development, signaling, and ecosystem interactions. *Plant Physiol.* **2021**; 185(4): 1267–1269.
- Eizenberg H and Goldwasser Y. Control of Egyptian Broomrape in Processing Tomato: A Summary of 20 Years of Research and Successful Implementation. *Plant Disease.* **2018**; 102: 1477– 1488.
- Jaiswal A, Panda A, Kumar S and Mishra S. (2021) Medicinal parasitic plants of Odisha. In: *Medico-Biowealth of India, Volume 3*, Ambika Prasad Research Foundation, Odisha, India.
- Jaradat N, Qadi M, Ali I, Hussein F, Issa L, Rashdan D, Jamoos M, Najem R, Zarour A, Arar M. Phytochemical screening, ant obesity, antidiabetic and antimicrobial assessments of *Orobanche aegyptiaca* from Palestine. *BMC Complement Med Ther.* **2021**; 21: 256.
- Lim YC, Rajabalaya R, Lee SH, Tennakoon KU, Le OV, Idris A, Zulkipli IN, Keasberry N, David SR. Parasitic mistletoes of the genera *Scurrula* and *Viscum* from bench to bedside. *Molecules.* **2016**; 21: E1048.

- Musselman LJ and Press MC. (1995). Introduction to parasitic plants. In: MC Press, JD Graves, eds. Parasitic Plants. Chapman & Hall, London, UK.
- Press MC and Phoenix GK. Impacts of parasitic plants on natural communities. *New Phytology*. 2005; 166:737–751.
- Raja K, Balamurugan V, Selvakumar S, Vasanth K. *Striga angustifolia* mediated synthesis of silver nanoparticles: Anti-microbial, antioxidant and anti- proliferative activity in apoptotic p53 signalling pathway. *Journal of Drug Delivery Science and Technology*. 2021; 67: doi.org/10.1016/j.jddst.2021.102945.
- Sahu S, Kumar S and Singh NR. (2018). Parasitic plants of Odisha. APRF Publishers, Odisha.
- Tlau L, Lalawmpuii L. Commonly used medicinal plants in N. Mualcheng, Mizoram, India. *Science Vision*. 2020; 20(4): 156-161.

Yams of India and their medicinal values

Kartik Chandra Guchhait¹, Gajender Singh², Soumi Sardar³, Vidyanand Kumbhojkar⁴, Sugimani Marndi⁵ and Sanjeet Kumar^{5*}

¹Vidyasagar University, Paschim Medinipur, West Bengal, India

²School of Pharmaceutical and health sciences Career Point University, Hamirpur, Himachal Pradesh, India

³University of Kalyani, Nadia, West Bengal, India

⁴Seth Govindji Raoji Ayurved Mahavidyalay, Solapur, India

⁵Ambika Prasad Research Foundation, Odisha, India

*Email Id: sugimani2marndi@gmail.com

DOI:10.5281/zenodo.6057134

ABSTRACT

In India, food and health problems are major concern. Hence, researchers throughout the world searching nutraceutical from indigenous practices. The tuberous plants could play a vital role to mitigate the above problems as they have food and medicinal values. Keeping this in view, an attempt has been made to document the medicinal values of some common *Dioscorea* species (Yam) from India. The results revealed that about 17 common species of *Dioscorea* available in India and used for medicinal purposes. The present study highlights the importance of tuberous plants as future nutraceutical.

Keywords: *Dioscorea*, Food values, Medicinal values, Indigenous practices.

INTRODUCTION

Dioscorea species is popularly known as "Yam" belonging to the family Dioscoreaceae. They are climbing herbs and play a vital role in providing food and medicines globally (Bhattacharjee *et al.*, 2011). They are also cultivated for the consumption of their starchy tubers in Temperate and Tropical areas. They are also consumed by the faunal species. The genus comprises of about 682 species throughout the world and observed highest in Southeast Asia, Africa, Australia, and Tropical America (Waris *et al.*, 2021). In India, about 42 species of *Dioscorea* are recorded (Simpson 2010; Mahanti *et al.*, 2018; Salehi *et al.*, 2019; Waris *et al.*, 2021; Mishra and Kumar 2021). The species are known for their food values, medicinal values and anti-nutritional factors but not documented in appropriate way. They have many medicinal uses and used as post pregnancy tonic, in piles, dysentery, as an anti-diabetic agents etc (Kumar *et al.*, 2017). Keeping all the importance of *Dioscorea* (Yam) species and need to document them. An attempt has been made to document the medicinal values of some commonly used *Dioscorea* species of India through field and literature survey.

METHODOLOGY

Field survey was conducted in the year of 2020-2022 in some particular districts of selected states in India along with literature survey. Plant was identified by Dr Sanjeet Kumar the CEO of Ambika Prasad Research Foundation, Odisha, India with the help of available literature (Haines 1925; Saxena and Brahman 1995).

RESULTS AND DISCUSSION

Studies revealed that yams species like *Dioscorea alata*, *Dioscorea belophylla*, *Dioscorea bulbifera*, *Dioscorea deltoidea*, *Dioscorea dumetorum*, *Dioscorea esculenta*, *Dioscorea glabra*, *Dioscorea hamiltonii*, *Dioscorea hispida* etc. are used to treat various diseases like tuber of *Dioscorea alata*, *Dioscorea belophylla*, *Dioscorea hamiltonii*, *Dioscorea puber* and *Dioscorea wallichii* is used as a tonic and health supplement. Tuber of *Dioscorea bulbifera*, *Dioscorea dumetorum*, *Dioscorea glabra*, *Dioscorea hispida* and *Dioscorea pentaphylla* is used as a birth control agent. Tuber of *Dioscorea esculenta*, *Dioscorea rotundata* and *Dioscorea spinosa* is used to treat skin infections (Table 1; Plate 1). Kumar et al. (2017) reported that *Dioscorea* has many medicinal uses from Odisha. Waris et al. (2021) and Salehi et al. (2019) reported that *Dioscorea* species has wide range of medicinal uses. From Mizoram, Lalfakzuala (2007) reported that tuber of *Dioscorea alata* has medicinal values like used in leprosy and piles. In 2017, Kumar et al. also reported that tuber of *Dioscorea alata* is used as a health supplement. In 2018, Mustafa et al. reported that tuber and leaves of *Dioscorea belophylla* is used to treat jaundice, malaria and dysentery. In 2021, Waris et al. reported that tuber, leaves and stem of *Dioscorea deltoidea* is used to treat jaundice. In 2021, Mishra and Kumar reported that tuber of *Dioscorea dumetorum* is used as a birth control agent. In 2012, Pillai et al. reported that *Dioscorea esculenta* has starch content which makes it viable for medicinal uses. In 2021, Parida and Sarangi reported that tuber *Dioscorea glabra*, *Dioscorea puber* and *Dioscorea wallichii* has many medicinal uses.

Table 1: Some commonly used medicinal yams of India

Botanical name	Vernacular name(s)	Medicinal uses	Source(s)
<i>Dioscorea alata</i>	Khamba aalu	Tuber is used as a tonic and health supplement.	Lalfakzuala et al., (2007); Present study
<i>Dioscorea belophylla</i>	Speare-leaved-yam	Tuber is consumed as a tonic.	Mustafa et al. (2018); Present study
<i>Dioscorea bulbifera</i>	Pita aalu	Tuber is used as a birth control agent.	Waris et al. (2021); Present study.
<i>Dioscorea deltoidea</i>	Nepal yam	Tuber juice is used to cure jaundice.	Kumar et al. (2017)
<i>Dioscorea dumetorum</i>	Bitter yam	Tuber is used as a birth control agent.	Mishra and Kumar (2021); Present study
<i>Dioscorea esculenta</i>	Lesser yam	Tuber is used in skin infections.	Kumar et al. (2017); Present study
<i>Dioscorea glabra</i>	Ban aalu	Tuber is used as a birth control agent.	Waris et al. (2021); Present study
<i>Dioscorea hamiltonii</i>	Meram aalu	Food supplement	Kumar et al. (2017); Present study
<i>Dioscorea hispida</i>	Indian three-leaved yam	Tuber is used as a birth control agent.	Parida and Sarangi 2021; Present study
<i>Dioscorea kamooneensis</i>	Ranee bhyaaakur	Tubers are used in the treatment of rheumatism.	Kumar et al. (2017)
<i>Dioscorea oppositifolia</i>	Pungent wild yam	Tuber is used for post pregnancy tonic.	Parida and Sarangi (2021); Present study
<i>Dioscorea pentaphylla</i>	Five leaf yam	Tuber is used as a	Prakash and Hosetti

		birth control agent.	(2010)
<i>Dioscorea puber</i>	Kukai sanga	Tuber is used as a health supplement.	Parida and Sarangi (2021); Present study
<i>Dioscorea rotundata</i>	White yam	Tuber paste is used in skin diseases	Kumar et al. (2021)
<i>Dioscorea spinosa</i>	Kanta aalu	Tuber is used against fungal infection	Kumar et al. (2017)
<i>Dioscorea trinervia</i>	Thassap	Tuber is used to cure diabetes.	Waris et al. (2021)
<i>Dioscorea villosa</i>	Ban aalu	Tuber is used to treat menstrual pain.	Waris et al. (2021)
<i>Dioscorea wallichii</i>	Suta aalu	Tuber is used as a fiber supplement	Parida and Sarangi (2021); Present study

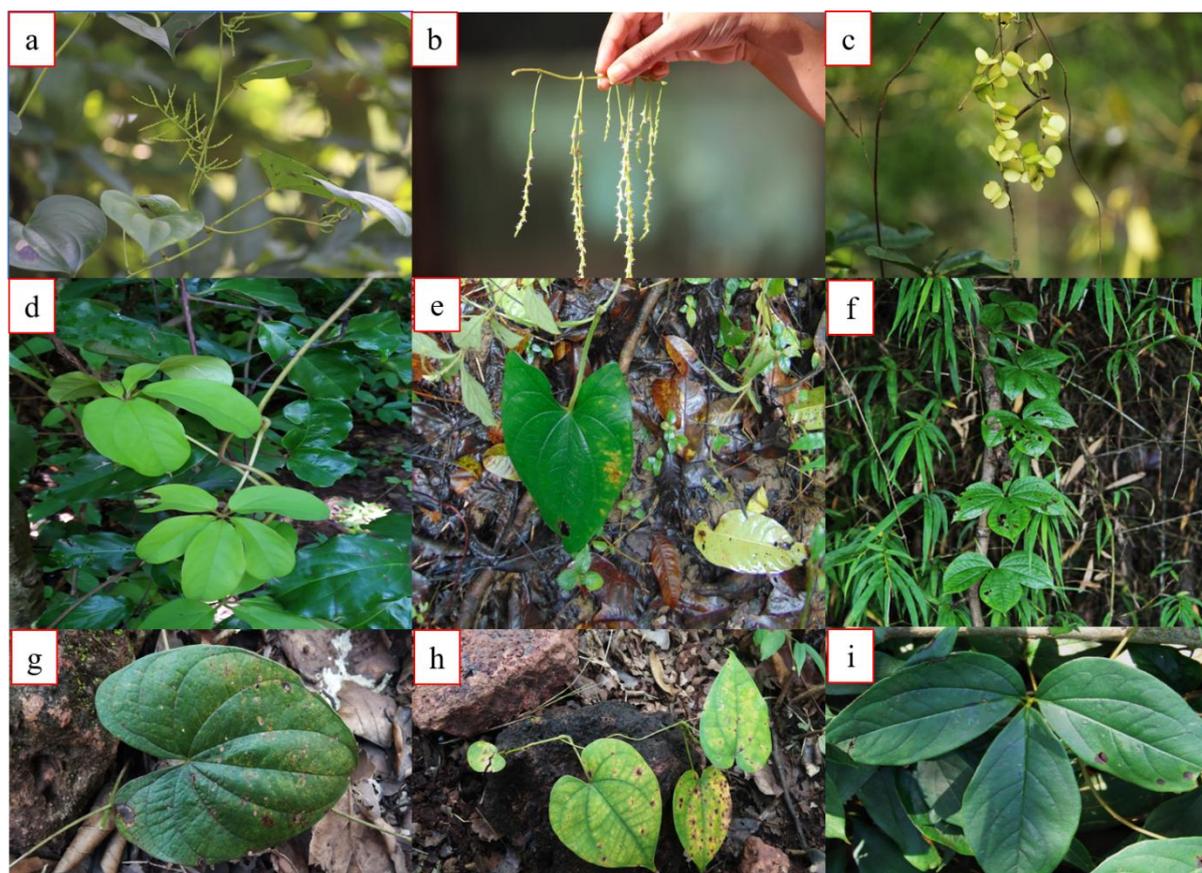


Plate 1: Some common *Dioscorea* species available in India, a) *Dioscorea esculenta*; b) *Dioscorea bulbifera*; c) *Dioscorea oppositifolia*; d) *Dioscorea pentaphylla*; e) *Dioscorea alata*; f) *Dioscorea dumetorum*; g) *Dioscorea wallichii*; h) *Dioscorea puber*; i) *Dioscorea hispida*

CONCLUSION

The present study briefly address the food & health problems and their solution as tuberous nutraceuticals. The medicinal values of these 17 *Dioscorea* species of India indicated the future aspects in the development of drugs and nutraceuticals. They are used in different health care problems along with food values. Need more exploration works throughout the country and steps can be taken for value additions.

REFERENCES

- Bhattacharjee R, Gedil M, Sartie A, Otoo E, Dumet D, Kikuno H, Kumar PL and Asiedu R. *Dioscorea*. C. Kole-(ed.), 2011: 71-96.
- Haines HH. (1994). The Botany of Bihar and Orissa. Adlard & Sons, London.
- Kumar S, Das G, Shin HS and Patra JK. *Dioscorea* spp. (A wild edible tuber): A study on its ethnopharmacological potential and traditional use by the local people of Similipal Biosphere Reserve, India. *Frontiers of Pharmacology*. 2017.
- Lalfakzuala R, Lalramnghinglova H and Kayang H. Ethnobotanical usages of plants in western Mizoram. *Indian Journal of Traditional Knowledge*. 2007. 6(3): p. 486-493.
- Mahanti P, Ummalyma SB, Bhattarai B, Devi RS, Dhal NK and Kumar S. Taxonomical note & three new records of *Dioscorea* species to the flora of Periyar Tiger Reserve, Western Ghats, India. *Species*. 2018; 19: 44-47.
- Mishra S and Kumar S. *Dioscorea dumetorum* (Kunth) T. Durand & H. Schinz.: A new addition to the flora of India. *Species*. 2021; 22(69): 84-88.
- Mustafa A, Ahmad A, Tantray AH and Parry PA. Ethnopharmacological Potential and Medicinal Uses of Miracle Herb *Dioscorea* spp. *Journal of Ayurvedic and Herbal Medicine*. 2018; 4(2): 79-85.
- Parida S and Sarangi M. Medicinal uses of few edible tuber crops by “Dongria Kandha” tribes of Kandhamal district of Odisha, India. *Indian Journal of Traditional Knowledge*. 2021: 122-131.
- Prakash G and Hosetti BB. Investigation of antimicrobial properties of *Dioscorea pentaphylla* from Mid-Western Ghats, India. *Scientific world*. 2010; 8(8): 91-96.
- Salehi B, Sener B, Kilic M, Rad JS, Naz R, Yousaf Z, Mudau FN, Fokou PVT, Ezzat SM, Bishbishy MH, Taheri Y, Lucariello G, Durazzo A, Lucarini M, Suleria HAR and Santini A. *Dioscorea* plants: a genus rich in vital Nutra – pharmaceuticals – a review. *Iranian Journal of Pharmaceutical Research*. 2019; 18(1): 68-89.
- Saxena HO and Brahmam M. (1995). The flora of Orissa. Orissa Forest Development Corporation & RRL, Bhubaneswar.
- Simpson MG. 7- Diversity & Classification of flowering plants: - Amborellales, Nymphaeales, Austrobaileyales, Magnoliids, Ceratophyllales & Monocots. *Plant Systematics* (Second edition). 2010: 181-274.
- Waris R, Tripathi S, Shukla AC and Agnihotri P. An review of the genus *Dioscorea* L. (*Dioscoreaceae*) in India. *Plant Science today*. 2021; 8(1): 72-78.

Medicinally important species of Fabaceae family of Loktak lake, India

Rajkumari Supriya Devi^{1*}, Rakhee Dimri², Ramadevi Devarakonda³, Vishnoo Omar⁴ and Sanjeet Kumar⁵

¹School of Applied Sciences, Centurion University of Technology and Management, Bhubaneswar, Odisha

²Department of Botany, VSKC Government PG College, Dakpathar, Vikashnagar, Utrakhnad, India

³Central Council Research for Ayurveda, Jhansi, Uttar Pradesh, India

⁴Department of Entomology, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, India

⁵Ambika Prasad Research Foundation, Odisha, India

*Email-Id: supriyark91@gmail.com

DOI: 10.5281/zenodo.6361317

ABSTRACT

Researchers throughout the world are searching nutraceutical after post COVID-19. Nutraceuticals have food as well as medicinal values. The species belonging to Fabaceae are used as food and having intrinsic medicinal values. Keeping this in view, an attempt has been made to enumerate the medicinally important species belonging to the family of Fabaceae from Loktak lake, Manipur. Survey was made during 2018-2020. The results revealed that 10 species belonging to Fabaceae are used to cure many diseases and disorders having food values. The present study highlights the importance of Fabaceae family as a source of nutraceuticals.

Keywords: Nutraceutical, pandemic, food values, medicinal values, wetland

INTRODUCTION

In December 2019, COVID-19 was declared as a pandemic by the World health Organization and within months extended globally. Due to spreading capacity, most of countries face continuous lockdowns up to 6-12 months. The lockdown created negative impacts on all aspects of human life. To mitigate the healthcare problems raised due to COVID-19 pandemic, researchers started searching the preventive and curative agents. The major preventive mechanism against COVID-19 is to enhance the immunity. To increase the immunity is not a game of one night. It always takes time and need proper nutrition and life style. Only medication is not able to improve the immunity. There are two major ways to improve the natural immunity. To adopt the indigenous food systems and to consume organic nutraceuticals. Therefore, researchers globally started screening of unexplored plants having food and medicinal values along with documentation-validation of tribal claims. For screening, the plants having food-medicinal values, Fabaceae might be good source. The pod and seeds of species belongs to Fabaceae is used as a food since long (Emel 2006). Many researchers also reported the medicinal values of the pods of the species belongs to Fabaceae. Hence, in present study, community of Loktak lake is selected to gather the information on food-medicinal values of species belongs to Fabaceae. Loktak lake (Figure 2a-b) is situated in Manipur and known as floated lake of the world. The community of

Loktak lake has unique skills to use the bio-wealth of the areas around the lake. Lack of documentation is also observed from literature. Therefore, keeping this in view, an attempt has been made to document the species of Fabaceae available around the lake and used by the local community as nutraceutical. The present study brings attention towards the importance of bio-wealth of the lake for sustainable development and to improve the immunity through local nutraceuticals to fight against health care problems.

METHODOLOGY

The enumeration of the plants belonging to family was done through field survey during the year 2018-2020. Plant specimens were identified by Dr. Sanjeet Kumar, Regional Centre, Ambika Prasad Research Foundation, Imphal, Manipur. The uses were noted down through semi-structured and random interviews with local community.

RESULTS

The survey revealed that 10 species of 8 genera belonging to the family Fabaceae are used as nutraceutical by the local community (Figure 1). It was observed that bark infusion of *Acacia decurrens* is used to cure diarrhoea, whereas flowers of *Bauhinia purpurea* are used to make tea to cure cough. Paste of *Aeschynomene americana* is used to cure fungal infections while root paste of *Mimosa pudica* is used to cure skin infections. Details are listed in the Table 1 & Figure 1.

Table 1: Medicinally important Fabaceae of Loktak lake, Manipur, India

Plant name	Parts used	Medicinal uses	Food values
<i>Acacia decurrens</i>	Bark	Bark infusion is used to cure diarrhea.	✓
<i>Aeschynomene americana</i>	Whole plant	Paste is used to cure fungal infections.	✓
<i>Aeschynomene aspera</i>	Whole plant	Paste is used to cure fungal infections.	✓
<i>Albizia lucidior</i>	Bark	Paste is used to cure fungal infections.	✓
<i>Bauhinia purpurea</i> (Figure 2b)	Flowers	Flowers are used to make tea. Tea is used to cure cough.	✓
<i>Codariocalyx motorius</i>	Root	The juice of root is used to cure cold & fever.	✓
<i>Mimosa pudica</i> (Figure 2c)	Root	Root paste is used to cure skin infections.	✓
<i>Neptunia oleracea</i>	Stem and leaf	Stem and leaves are used in sinusitis.	✓
<i>Vigna grandiflora</i>	Pods	Pulses are used to treat kidney problems.	✓
<i>Vigna mungo</i>	Pods	Pulses are used to treat body pain.	✓

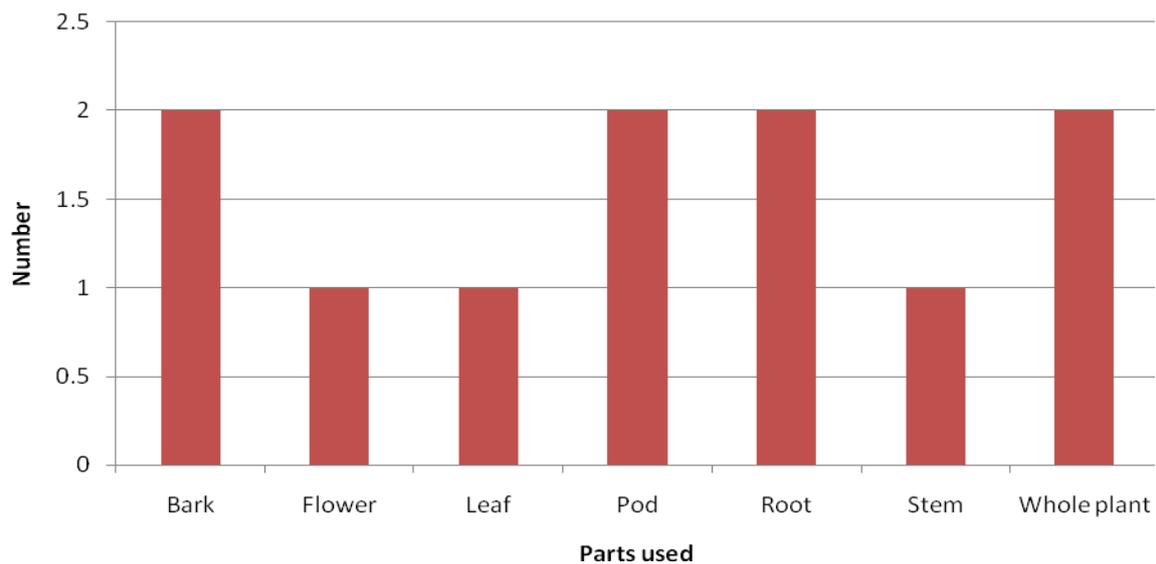


Figure 1: Plant parts used to cure diseases and disorders



Figure 2: Panoramic view of Lokatak lake and some common medicinally important species, a-b) Loktak lake, b) *Bauhinia purpurea*, c) *Mimosa pudica*

DISCUSSION

Few researchers have documented the food and medicinal values of the species belongs to Fabaceae available in Loktak lake, Manipur, India. Meitei and Prasad (2013) reported two medicinal species belonging to Fabaceae from Lokatak lake. Devi et al. (2014) reported one species (*Vigna mungo*) of Fabaceae from Loktak lake and described its medicinal and food values. Devi et al. (2017) also reported one species (*Neptunia oleracea*) of Fabaceae from Loktak lake. Laishram (2021) reported two species of Fabaceae from Lokatk lake having food values.

CONCLUSION

Wild nutraceutical would be demanding herbal products in 21st century and onwards. They act as preventive agents against diseases and disorders & also play an important role to fight food problems. Hence, there is a need to explore the plants having both these values. The present paper highlights the nutraceutical values of 10 species belonging to Fabaceae of Loktak lake. They could also serve as a source provide a source to develop future nutraceuticals for sustainable development. Further, more exploration works are needed followed by evaluation of their food and medicinal values to do for the purpose of value addition. in the future.

ACKNOWLEDGEMENT

Authors are thankful to the local community of Lokatak lake and team members (Sugimani Marndi & Prapti Kondaji) of APRF, Odisha.

REFERENCES

- Devi MH, Singh PK and Choudhury MD. Income generating plants of Keibu Lamjao National Park, Loktak Lake, Manipur and man-animal conflicts. *Pleione*. 2014; 8(1): 30-36.
- Devi SN, Singh KS and Chanu PO. Traditional vegetables with medicinal value from Loktak lake shore and threats to the community around. *International Journal of Current Research*. 2017; 9(5): 50974-50978.
- Laishram J. A study on the bio-resources of the Loktak lake, Manipur (India) for livelihood by the people living in five villages located in and around the lake. *Current World Environment*. 2021;16(3):928-941.
- Meitei MD and Prasad MNV. Phoomdi-a unique plant bio-system of Loktak lake, Manipur, North-East India: traditional and ecological knowledge. *Plant Bio-systems*. 2013; DOI: 10.1080/11263504.2013.870250.
- Emel OD. Prehistoric and medieval plant remains from two sites on the Euphrates, South-eastern Turkey. *Turkish Journal of Botany*. 2006; 30: 11-38.

Preventive nutraceutical against coronavirus

Tikendrajit Baro¹, Pradip Kumar Patel², Rakhee Dimri³, and Sanjeet Kumar^{4*}

¹Department of Biotechnology, Bodoland University, Kokrajhar, Assam, India

²Department of Entomology, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, India

³Department of Botany, VSKC Govt. (PG) College, Dakpathar, Vikasnagar, Uttarakhand, India

⁴Biodiversity and Conservation Lab., Ambika Prasad Research Foundation, Odisha, India

*Email Id: sanjeetaprf@gmail.com

DOI: 10.5281/zenodo.6376177

ABSTRACT

Coronavirus created a havoc in all over the world. Most of the countries trying their best to overcome this hurdle that has taken many lives. Many researchers are looking for its cure but it comes in a new variant in every upcoming year. Vaccinations are going on at alarming rate although need to improve the immunity level. Therefore, keeping this in view, an attempt has been made to document the commonly plants used to enhance the immunity traditionally. A survey was made during 2020-2022 in selected states of India. Survey results revealed that about 15 commonly plants and their parts are used to enhance the immunity. The present study highlights the importance of locally available plants in this current healthcare problem throughout the world.

Keywords: *Coronavirus, nutraceutical, immunity, medicinal plants*

INTRODUCTION

Coronavirus has created chaos in all over the world in due to its fast spreading characters (Vkovski *et al.*, 2021). The first case was reported in 31 December 2019 in Wuhan city of China and after that WHO (World Health Organization) has worked around the clock to fight against the coronavirus. WHO declared that vaccination is the first preventive measure. Secondly it has suggested to improve the immunity level that will help us to fight against this group of virus (www.who.int). Medicinal plants have been constant use in ancient times and are proved to most effective in increasing the immunity. Therefore, researchers and scientist are working on indigenous knowledge to improve the immunity using medicinal plants. Nowadays, mankind is going backwards era where we used to have great immunity level which makes us less dependent on modern medicines. We were strong enough to fight to common cold and fever because, we had strong immunity level. Medicinal plants are used to make our immunity strong (Khadka *et al.*, 2021). Long time back aged people used to be strong by taking medicinal plants to boost the immunity (Adhikari *et al.*, 2020). At times of our grandmother we used to consume ginger, amla, neem and many others to boost our immunity level. In literature, many researchers concluded that the secondary metabolites in them shows a wide range of nutraceutical values. The Indian Traditional System of Medicine is one of the oldest systems of medical practices in the world and has played an essential role in providing health care services to the human civilization. India has the exclusive distinction of its own recognized traditional medicine like Ayurveda, Yoga, Unani, Siddha, and Homoeopathy (AYUSH) (Adhikari and Paul

2018). Keeping this in view, an attempt has been made to document the commonly used medicinal plants to improve the immunity through survey in selected states of India. The present study highlights the importance of local plants and indigenous knowledge to fight against contemporary health problems globally.

METHODOLOGY

Survey was carried out in 2020-2022 in selected states of India (Manipur, Jharkhand, Odisha, Uttarakhand, West Bengal). Ethnobotanical study was carried out through discussion with local people. The plant species are identified by Dr Sanjeet Kumar the CEO of Ambika Prasad research foundation, Odisha followed by flora's book (Haines 1925; Saxena and Brahman 1995).

RESULT AND DISSCUSSION

The results revealed that about 15 common plants are used to improve the immunity. The enumerated species are *Ocimum tenuiflorum*, *Ocimum basilicum*, *Cinnamomum verum*, *Zingiber officinale*, *Curcuma longa*, *Phyllanthus emblica*, *Azadirachta indica*, *Syzygium aromaticum*, *Cymbopogon jwarancusa*, *Llicium verum*, *Punica granatum*, *Leucas cephalotes*, *Allium sativum*, *Allium cepa* and *Piper longum* (Table 1; Plate 1). The maximum enumerated species are belongs to the family like Liliaceae, Lamiaceae, Zingiberaceae etc which could be preventive agents against coronavirus. It was noted that bulb, flower, stem, bark, rhizome and fruits are mostly used. Due to their food values, they are prescribed as nutraceuticals against coronavirus. In the year 2021, Timalcina et al. reported that *Azadirachta indica*, *Allium cepa*, *Allium sativum*, *Ocimum tenuiflorum* have nutraceutical values. In the year 2020, Adikari et al. documented that *Azadirachta indica* and *Curcuma longa* has nutraceutical values against Coronavirus. Lamiaceae family has such secondary metabolites which is helpful to get relieve from cold and cough (Ibrahim et al., 2016; Miraj and Kiani 2016; Shahrajabian and Cheng 2020). In the year 2020, Ahmad et al. reported that *Phyllanthus emblica*, *Piper longum*, *Allium sativum* have some secondary metabolites which is helpful to fight against coronavirus. WHO states that triphala which includes *Phyllanthus emblica* is a good way to boost the immunity (Mukherjee et al., 2006; Sharma 2015).

Table 1: Some preventive nutraceuticals against coronavirus.

Botanical name	Family	Common name	Plant part
<i>Allium cepa</i>	Liliaceae	Piaz	Bulb
<i>Allium sativum</i>	Liliaceae	lasan	Bulb
<i>Azadirachta indica</i>	Meliaceae	Neem	Flower
<i>Cinnamomum verum</i>	Lauraceae	Tvak	Stem and bark
<i>Curcuma longa</i>	Zingiberaceae	Haldi	Rhizome
<i>Cymbopogon jwarancusa</i>	Poaceae	Lamjak	Whole plant
<i>Leucas cephalotes</i>	Lamiaceae	Gaisha	Whole plant
<i>Llicium verum</i>	Schisandraceae	Star anise	Fruit
<i>Ocimum basilicum</i>	Lamiaceae	Vana tulsi	Leaf and flower
<i>Ocimum tenuiflorum</i>	Lamiaceae	Tulsi	Leaf and seed
<i>Phyllanthus emblica</i>	Euphorbiaceae	Amla	Fruit
<i>Piper longum</i>	Piperaceae	Pipali	Fruit

<i>Punica granatum</i>	Lythraceae	Dadima	Fruit
<i>Syzygium aromaticum</i>	Myrtaceae	Lavanga	Flower bud
<i>Zingiber officinale</i>	Zingiberaceae	Adrak	Rhizome



Plate 1: Some nutraceuticals against Coronavirus

CONCLUSION

The present study briefly address the importance of nutraceuticals against coronavirus. Many scientists and researchers are working on coronavirus that has taken many lives. Vaccines are available but not to such an extent that it can stop this virus action. Therefore, need a healthy food with some locally available medicinal plants to enhance the immunity. In this aspect, the present study gives a base line data and recommends to use the locally available plants having nutraceutical values to fight against the COVID-19 pandemic.

REFERENCES

- Adhikari B, Marasini BP, Rayamajhee B, Bhattarai BR, Lamichhane G, Khadayat K, Adhikari A, Khanal S, Parajuli. Potential roles of medicinal plants for the treatment of viral diseases focusing on COVID- 19: A review. *Phytother Research*. 2020; 35(3): 1298-1312.
- Adhikari PP and Paul SB. (2018). History of Indian traditional medicine: a medical inheritance. *Asian Journal of Pharm Clin Res*. 2018;11(1):1-421.
- Ahmad S, Zahiruddin S, Parveen B, Parveen A, Gaurav, Parveen R and Ahmad M. (2021). Indian medicinal plants and formulations and their potential against COVID -19 – preclinical and clinical research. *Frontiers in Pharmacology*. 2021; 11:578970.

- Haines HH. (1994). The Botany of Bihar and Orissa. Adlard & Sons, London. 1994
- Ibrahim ME, Mohamed MA and Wahba HE. Introduction of *Ocimum tenuiflorum* plant to the Egyptian cultivation. International Journal of Pharm Tech Research. 2016; 9(9):18-24.
- Khadka D, Dhamala MK, Li F, Aryal PC, Magar PR, Bhatta S, Thakur MS, Basnet A, Cui D and Shi S. The use of medicinal plants to prevent COVID – 19 in Nepal. Journal of Ethnobiol Ethnomed. 2021; 17(1):26.
- Miraj S and Kiani S. Study of pharmacological effect of *Ocimum basilicum*: a review. Der Pharmacia Lettre. 2016; 8(9): 276-280.
- Saxena HO and Brahmam M. (1995). The flora of Orissa. Orissa Forest Development Corporation & RRL, Bhubaneswar.
- Shahrajabian MH and Cheng WSQ. Chemical components and pharmacological benefits of Basil (*Ocimum basilicum*): a review. International Journal of Food Properties, 2020; 23(1):1961-1970.
- Sharma S. Triphala powder: a wonder of Ayurveda. International Journal of Recent Research Aspects. 2015; 2(1):107-111.
- Timalsina D, Pokhrel KP and Bhusal D. Pharmacologic activities of plant derived natural products on respiratory diseases and inflammations. BioMed Research International. 2021;1-23.
- Vkovski P, Kratzel A, Steiner S, Stalder H and Thiel V. Coronavirus biology and replication: implications for SARS-CoV-2. Nat Rev Microbiol. 2021;19(3): 155-170
- WHO | World Health Organization; Coronavirus (COVID-19) events as they happen (who.int).



APRF PUBLISHERS
5F/561, SECTOR-9, CDA
CUTTACK- 753014

