Climbers of Rourkela Forest Division: ecological, medicinal, food and economical aspects

ABSTRACT

Sunlight is a scarce resource for plants growing on forest floors, yet climbers could scale trees and bushes to reach the light. Climbers are vital because they help to lower temperature and keep the forest cooler on a hot season. They provide food, shelter and many more to the wildlife and local communities. Still, they are not much explored. Therefore, a survey was carried out in Rourkela Forest Division took place during March – April 2023, and enumerated climbers along with uses. Results revealed that about 53 species of climber belonging to 20 families are available in the study areas. They are used by local communities as food, medicine, source of livelihood and have ecological values. Therefore, authors summarised the diversity of climber and documented it in a scientific manner for future restoration and making plant for value addition in study areas.

Keywords: Wild animal, edible, tribal communities, medicinal, economic, decoration, shading

INTRODUCTION

Rourkela Forest Division is one of the three forest divisions in Sundargarh District. Other divisions are the Sundargarh Forest Division and the Bonai Forest Division (Pradhan et al., 2023). The division has Reserved Forests, Proposed Reserved Forests, Demarcated Protected Forests, Village Forests, Protected Forests, and DLC Forests. The total forest area was computed to be 1100.43 sq. km, which is about 36.73% of the geographical area of the division. It is also known as the Steel City of Odisha," and it is situated in the northern district of Sundargarh, Odisha, India. The area is rich with forests and tribal communities with abundant traditional knowledge. Climbers are vigorous. However, despite its importance in the world's flora, it has subsequently been generally neglected. The climbers exist among ancestral angiosperm groups and monocotyledonous families and are commonly represented in major groups of Rosids and Asterids.

Climbers generally identify them as having elongated internodes (the length of stem between each leaf joint) to help cover the distance, but they employ other structures to get a grip, including tendrils, aerial roots, and twining stems. Some climbers are characterised by spring-

like tendrils as members of the cucumber family (Plate 1). It is derived from modified leaves. They hook on to a branch, then coil up, pulling the vine towards its support structure. The tendrils coil when the cells on each side grow at different rates. Surface hairs detect foreign objects and stimulate twining. Tendrils recognise their own stems and avoid twining around them. Another climbing technique is characterised by twining stems (Plate 2). Tendrils, aerial roots, and hooked prickles all attach themselves to supports, but in some climbers, the stem itself can cling by twining. Some twining plants twist clockwise, while others twist anti-clockwise. Long leaf stalks allow the leaves to reach away from the support and face the sun. Emerging flowers have the potential to release many seeds, further expanding the plant's territory. The ability of one stem to twine around another is due to thigmotropism. When climbing stems and tendrils detect the presence of a support, one side of the growing point begins faster than the other, making the stem bend (Gianoli 2015). It is quietly available all over the world, and some are used for an edible purpose and others having medicinal, economic, and ecological potential. Fewer documentations are available on climbers and their importance. Therefore, an attempt has been made to document them from Rourkela Forest Division, Odisha, India.

METHODOLOGY

A survey was carried out in Rourkela Forest Division, Odisha during March to April 2023 to enumerate the climbers and their traditional uses. The traditional knowledge is carried out using semi- questionnaire PDF (Passport Data Form). Interviews were conducted in study areas and information was collected, analysis and tabulated. The enumerated climbers were identified by Dr. Sanjeet Kumar, Ambika Prasad Research Foundation, Odisha, India with the help of available literature (Haines 1925; Saxena and Brahman 1995; Kumar and Satapathy 2011; Kumar et al., 2012; Misra et al., 2012; Kumar and Dash 2012; Kumar et al., 2013; Tripathy et al., 2014; Kumar 2015; Tripathy et al., 2015; Kumar and Jena 2017; Kumar and Tripathy 2017; Kumar et al. 2018; Ummalyma et al., 2018; Biswal et al., 2020; Devi et al., 2020; Devi et al., 2021; Snehalata et al., 2022; Kumar et al., 2021; Das et al., 2022; Sharma et al., 2022; Mety 2023; Dimri et al., 2023; Nayak and Kumar 2023).

Plate 1: Climbing techniques: Spring like tendrils

Plate 2: Climbing technique: Twining stem

RESULTS AND DISCUSSION

Data enumerated through ethnobotanical survey plant species with their vernacular names: medicinal, economic, ecological, and food. The results revealed that about 53 plant species were enumerated in Rourkela Forest Division, Odisha. According to the results, it is revealed

that some climbers are used for medicinal purposes other than food, ecological, and economic purposes. Climbers are used for medicinal, food, economic, and ecological purposes listed according to family (Figure 1, Figure 2, Figure 3, Figure 4). Climbers are important because, due to their characteristic features, climbers on the wall will reduce the temperature and keep the garden, backyard, or balcony cooler on summer days. In forest areas, climbers are one of the reasons for shade in the forest. On summer days, the wild animal has a convenient place to rest beneath the climbers, like *Bauhinia vahlii, Butea superba,*and *Combretum roxburghii*. Climbers on the walls of the houses, like *Antigonon leptopus*, *Capparis zeylanica*, *Clitoria ternatea*, *Coccinia grandis*, *Luffa acutangular*, *Luffa aegyptiaca*, *Momordica charantia, Passiflora foetida, Quisqualis indica,* and *Trichosanthes tricuspidate*. Many researchers have documented the diversity of climbers in Odisha. In 2012, Abhilash et al. reported the medicinal value and distribution of Nattika climbers. In 2014, Suthari et al. reported the ethnomedicinal and economic uses of climbers in northern Telangana, India. In 2015, Kalam and Ahmad reported the medicinal importance of climbers used in the Unani system of medicine. In 2020, Rahman et al. reported about the climbers in relation to their hosts in the Himalayas. In 2020, Mayurj and Kaushik reported on the climber and creeper plant species in Gujarat. In 2022, Khillar et al. reported climbers being used as food plants by the Santhal community in Odisha. In 2020, Das et al. reported the diversity of climbers in Odisha. Therefore, we need further documentation on climbers in Odisha.

Table 1: Climbers of Rourkela Forest Division, Odisha, India

Botanical name	Family	Common name	Medicinal	Economical	Ecological	Food
Abrus precatorius	Fabaceae	Kaincha	✓	✓	-	-
Ampelocissus latifolia	Vitaceae	Paninoho	✓	-	-	-
Ampelocissus tomentosa	Vitaceae	Kanjinoi	✓	-	-	-
Antigonon leptopus	Polygonaceae	Nil	✓	-	-	-
Argyreia nervosa	Convolvulaceae	Brudhha taraka	✓	-	-	-
Aristolochia	Aristolochiaceae	Iswar mula	✓	-	-	-

indica						
Asparagus racemosus	Asparagaceae	Satavari	✓	✓	✓	-
Bauhinia vahlii	Fabaceae	Siali	✓	✓	✓	✓
Butea superba	Fabaceae	Lota palasha	✓	-	✓	✓
Cajanus scarabaeoides	Fabaceae	Ban koltha		-	-	-
Capparis zeylanica	Capparaceae	Asadua	✓	-	-	-
Celastrus paniculatus	Celastraceae	Kujuri	✓	✓	-	-
Cissampelos pariera	Menispermaceae	Musakani	✓	✓	✓	-
Cissus quadrangularis	Vitaceae	Hada jodi	✓	-	-	-
Clematis roylei	Ranunculaceae	Ganamari	✓	-	✓	-
Clitoria ternatea	Fabaceae	Aparajita	✓	✓	✓	✓
Coccinia grandis	Cucurbitaceae	Bana kunduri	✓	✓	✓	✓
Combretum roxburghii	Combretaceae	Atundi	✓	-	✓	-
Cryptolepis buchanani	Apocynaceae	Dudhi nai	✓	-	-	-
Cuscuta reflexa	Convolvulaceae	Nirmuli	✓	-	-	-
Derris scandens	Fabaceae	Kentia	✓	-	-	-
Dioscorea bulbifera	Dioscoreaceae	Pita alu	✓	✓	-	✓
Dioscorea oppositifolia	Dioscoreaceae	Pani alu	✓	✓	-	✓
Diplocyclos palmatus	Cucurbitaceae	Shivlingi	✓	-	-	-
Erycibe paniculata	Convolvulaceae	Joda koli	✓	-	-	-

Getonia floribunda	Combretaceae	Dhonati	✓	-	-	-
Gloriosa superba	Colchicaceae	Agnisikha	✓	-	✓	-
Gouania leptostachya	Rhamnaceae	Rakta-pichali	✓	-	✓	-
Gymnema sylvestre	Apocynaceae	Gudmari	✓	✓	-	✓
Hemidesmus indicus	Apocynaceae	Anantamula	✓	-	✓	-
Hiptage benghalensis	Malpighiaceae	Boromali	✓	-	✓	-
Ichnocarpus frutescens	Apocynaceae	Shyama lata	✓	-	-	-
Ipomoea aquatica	Convolvulaceae	Kalama sago	✓	✓	✓	✓
Luffa acutangula	Cucurbitaceae	Jhonny	✓	✓	✓	✓
Luffa aegyptiaca	Cucurbitaceae	Luffa	✓	-	✓	-
Merremia umbellata	Convolvulaceae	Nil	✓	-	✓	-
Merremia vitifolia	Convolvulaceae	Nil	✓	-	✓	-
Momordica charantia	Cucurbitaceae	Kalara	✓	✓	✓	✓
Passiflora foetida	Passifloraceae	Bisripi	✓	-	-	-
Quisqualis indica	Combretaceae	Madhumalati	✓	-	✓	-
Scindapsus officinalis	Araceae	Gaja pipalli	✓	-	✓	-
Smilax perfoliata	Smilacaceae	Nil	✓	-	✓	-
Smilax zeylanica	Smilacaceae	Ramdatun	✓	-	✓	-

Solena amplexicaulis	Cucurbitaceae	Mitha kunduri	✓	-	✓	✓
Spatholobus parviflorus	Fabaceae	Lata polasa	✓	-	✓	-
Stephania japonica	Menispermaceae	Sondhimali	✓	-	-	-
Symphorema involucratum	Verbenaceae	Nil	✓	-	✓	-
Tiliacora acuminata	Menispermaceae	Nil	✓	-	-	-
Tinospora cordifolia	Menispermaceae	Guluchi	✓	✓	✓	-
Trichosanthes tricuspidata	Cucurbitaceae	Mahakal	✓	-	-	-
Vallaris solanacea	Apocynaceae	Nil	✓	-	✓	-
Ventillago denticulata	Rhamnaceae	Kantamali	✓	-	✓	-
Wattakaka volubilis	Apocynaceae	Nil	✓	-	✓	-

Plate 3: Climbers of Rourkela Forest Division, Odisha a) *Aristolochia indica,* b) *Spatholobus parviflorus,* c) *Cajanus scarabaeoides,* d) *Capparis zeylanica,* e) *Celastrus paniculatus,* f) *Merremia umbellata*

Plate 4: Climbers of Rourkela Forest Division, Odisha g) *Bauhinia vahlii,* h) *Momordica charantia,* i) *Luffa aegyptiaca,* j) *Vallaris solanacea,* k) *Ventillago denticulata,* l) *Merremia vitifolia*

Plate 5: Climbers of Rourkela Forest Division, Odisha m) *Diplocyclos palmatus*, n) *Symphorema involucratum*, o) *Hemidesmus indicus*, p) *Getonia floribunda*, q) *Tinospora cordifolia*, r) *Clitoria ternatea*

Plate 6: Climbers of Rourkela Forest Division, Odisha s) *Asparagus racemosus*, t) *Combretum roxburghii*, u) *Trichosanthes tricuspidate*, v) *Cissus quadrangularis*, w) *Smilax zeylanica*, x) *Gloriosa superba*

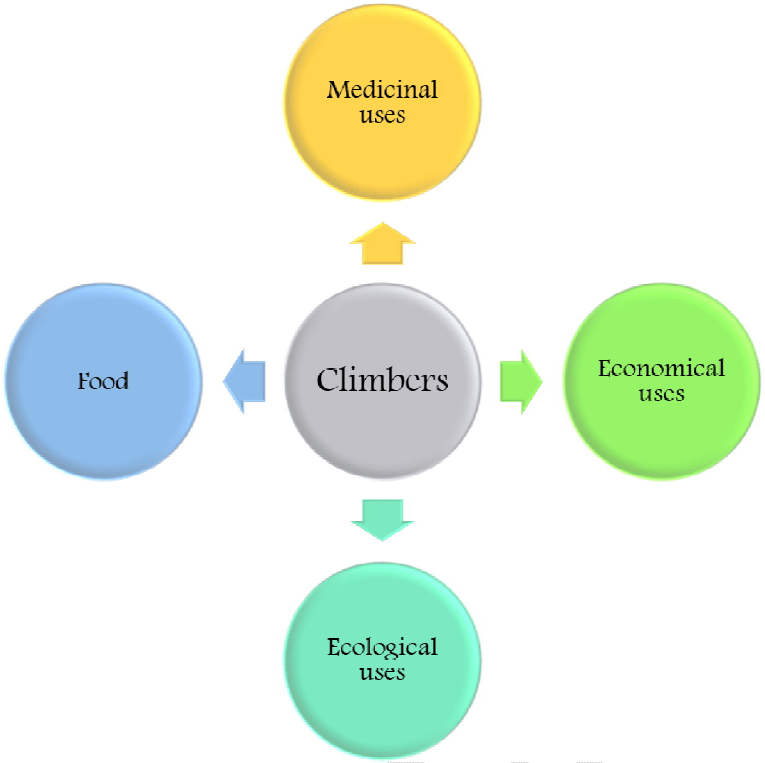

Figure 1: Uses of climbers in different aspects in Rourkela Forest Division, Odisha, India

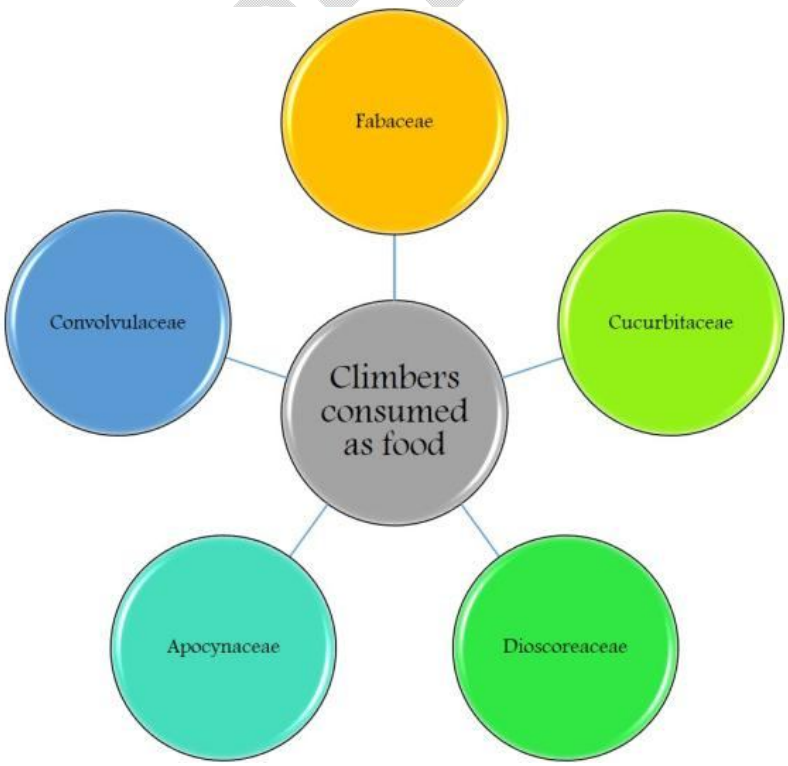

Figure 2: Family wise climber used as food purpose in Rourkela Forest Division, Odisha

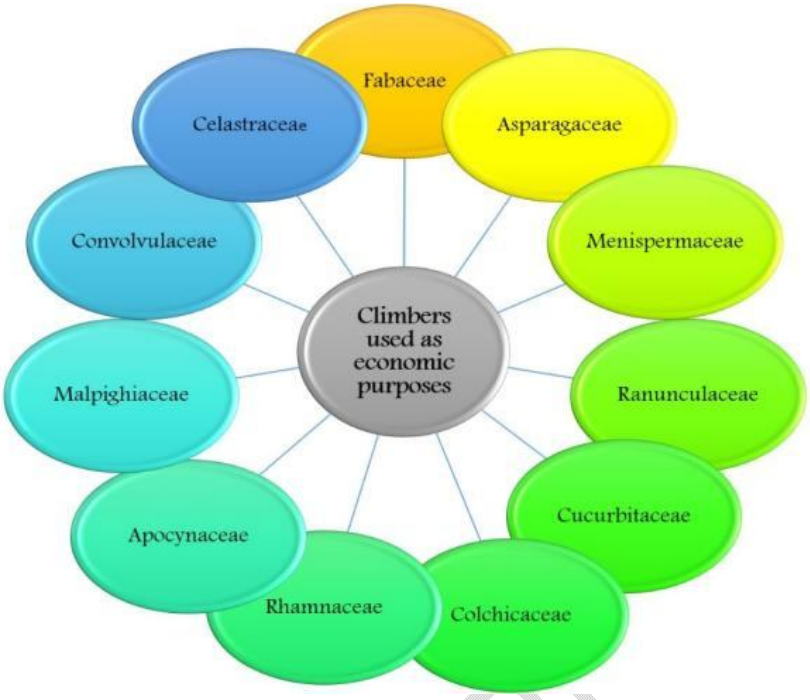

Figure 3: Family wise climbers used as economic purposes in Rourkela Forest Division, Odisha

Figure 4: Family wise climbers used as ecological aspects in Rourkela Forest Division, Odisha

CONCLUSION

Climbers are one of the important group of plants whose morphological support comes entirely from their own tissue and their original rooting position in the soil, and whose climbing efforts can take their foliage and reproductive organs into tree canopies. The current studies show 53 climber species were documented in Rourkela Forest Division, Odisha. The present paper highlights the food, medicinal, economic, and ecological values of climbers. Therefore, we need further more documentation works in a scientific manner.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Abhilash ES, Parayil SP, Raju AR, Sathian B, and Udayan V. (2012). A study on the medicinal value and distribution of climbers of Nattika, India. APJEESD. 1: 36-39.

Biswal SK and Kumar S. (2020). Medico-Biowealth of Odisha, APRF Publisher, India. ISBN: 978-81-945667-6-2.

Das L, Mishra S, Das A, Dimri R and Kumar S. (2022). Some common flora of temple city of Odisha, India: source for ethno-medico-cultural values. Indian Forester. 148(2): 207-212.

Das PK, Das MK, Sahu C, Rath SK, and Kumar S. (2020). Diversity of climbers of Odisha. Medico bio- wealth of Odisha. 1-11. ISBN: 978-81-938861-4-4

Devi RS, Kumar S, Hamdy RS and Khalkho AS. (2021). Medico Biowealth of India. APRF Publisher, India. ISBN: 978-81-952750-2-1.

Devi RS, Rath SK and Kumar S. (2020). Medico Biowealth of India. APRF Publisher, Odisha. ISBN: 978-81-945667-4-8.

Dimri R, Sharma BP, Kumar A, Behera B & Kumar S. (2023). Medico Bio-wealth of India, Volume 8, pp. 1– 149. APRF, Odisha, India. https://doi.org/10.5281/zenodo.8022779

Gianoli E. (2015). The behavioural ecology of climbing plants. AoB PLANTS 7: 13. doi:10.1093/aobpla/plv013

Haines HH. (1994). The Botany of Bihar and Orissa. Adlard & Sons, London. 1994

Kalam MA and Ahmad G. (2015). Medicinal importance of climbers used in Unani system of medicine. Biotechnological strategies for the conservation of medicinal and ornamental climbers. 65- 100. DOI 10.1007/978-3-319-19288-8_3

Khillar AK, Dagawal MJ, Saradar B, Jadhao AB, Marndi S, and Kumar S. (2022). Climbers used as a food plant by the santhal community. Indigenous Traditional Knowledge and Advancement in Medicinal Plant Research. 1-6. ISBN: 978-81-955847-2-7

Kumar S and Dash D. (2012). Flora of Nandan Kanan Sanctuary: Medicinal plants with their role in health care. International Journal of Pharmacy & Life Sciences. 3(4): 1631-1642.

Kumar S and Jena PK. (2017). Tools from Biodiversity: Wild Nutraceutical Plants. Ed: James N Furze et al.: Identifying Frontier Research Integrating Mathematic Approaches to Diverse Systems / Sustainability. Springer, Switzerland. DOI: 10.1007/978-3-319-43901-3-9.

Kumar S and Satapathy MK. (2011). Medicinal plants in an urban environment; herbaceous medicinal flora from the campus of Regional Institute of Education, Bhubaneswar, Odisha. International Journal of Pharmacy & Life Sciences. 2(11): 1206-1210.

Kumar S and Tripathy PK. (2017). Wild cucurbits: source of traditional therapeutic systems & medicine. LAMBART Academic Publishing. Pp-102.

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 tribal people of Similipal Biosphere Reserve, India. Frontiers in Pharamcology. 8:52: doi:10.3389/fphar.2017.0052.

Kumar S, Das G, Shin HS, Kumar P and Patra JK. (2018). Diversity of plant species in the Steel City of Odisha, India: ethnobotany and implications for conservation of urban bio resources. Brazilian Archives of Biology and Technology. DOI.org/10.190/1678-4324-2018160650.

Kumar S, Parida AK and Jena PK. (2013). Ethno-Medico-Biology of Ban Aalu (*Dioscorea* species): a neglected tuber crops of Odisha, India. International Journal of Pharmacy and Life Sciences. 4(12): 3143-3150.

Kumar S, Tripathy PK and Jena PK. (2012). Study of wild edible plants among tribal groups of Simlipal Biosphere Reserve Forest, Odisha, India; with special reference to *Dioscorea* species. International Journal of Biological Technology. 3(1): 11-19.

Kumar S. (2015). Life support plant species among aboriginals of Similipal Biosphere Reserve Forest, Odisha: Diversity and Conservation. International Journal of Biological Sciences and Engineering. 6(2): 80-86.

Kumar SN, Mishra S and Kumar S. (2021). Documentation of Indigenous Traditional Knowledge (ITK) on Commonly Available Plants in Koira Range, Bonai Forest Division, Sundargarh, Odisha, India. Asian Plant Research Journal. 8(4): 83-95.

Manjula BL, Kumar A, Sahu JK, Dash SS and Kumar S. (2022). Yam. APRF Publisher, India. ISBN: 978-81-955847-5-8; DOI: https://doi.org/10.5281/zenodo.7147528.

Mayurj P and Kaushik PC. (2020). Study of climber and creeper plant species growing in Talod Taluka of Sabarkantha district, Gujarat. International Journal of creative Research Thoughts. 8(6): 3433- 3450.

Mety SS, Sahu JK, Malhotra C, Barman H and Kumar S. (2023). Medicinal Climbers. APRF Publisher, India. ISBN: 978-81-955847-4-1; DOI: https://doi.org/10.5281/zenodo.7592862; Pp-1-42.

Misra RC, Kumar S, Pani DR and Bhandari DC. (2012). Empirical tribal claims and correlation with bioactive compounds: A study on *Celastrus paniculata* Willd., a vulnerable medicinal plant of Odisha. Indian Journal of Traditional Knowledge. 11(4): 615-622.

Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. APRF & SMPB, Odisha; APRF Publishers, India. ISBN: 978-81-958404-9-6. Pp 1-665.

Patel DK. (2014). Diversity of climber and creeper medicinal nd aromatic plants with special reference to their regeneration in herbal garden for Ex – situ conservation. International Journal of Current Research in Biosciences and Plant Biology. 1(4): 67-73.

Pradhan I, Rout S and Kumar S. (2023). Hooded Grasshopper Teratodes monticollis (Gray, 1832) Morphometric and Intraspecific Colour Variation from Bonai Forest Division, Odisha, India. Asian Journal of Biology. 18(4):1-5; DOI: 10.9734/AJOB/2023/v18i4347

Rahman AU, Khan SM, Saqib Z, Ullah Z, Ahmad Z, Ekercin S, Mumtaz AS, and Ahmad H. (2018). Diversity and abundance of climbers in relation to their hosts and elevation in the monsoon forests of Murree in the Himalayas. Pak. J. Bot. 52(2): 1-12.

Saxena HO and Brahmam M. (1995). The flora of Orissa. Orissa Forest Development Corporation & RRL,Bhubaneswar, India

Sharma BP, Bala M, Mishra S and Kumar S. (2022). *Dioscorea pubera* (Dioscoreaceae): an economically important wild nutraceutical. In Yam (pp. 18–28). APRF. https://doi.org/10.5281/zenodo.6999175.

Snehalatha VR, Harikumar J, Mahendru N, Pal N, Janali AB and Kumar S. (2022). Can *Dioscorea* species reduce oxidative stress? In: Kumar S (eds.), Medico Biowealth of India, APRF Publisher, Odisha, India. p. 38-42.

Suthari S, Sreeramulu N, Omkar K and Raju VS. (2014). The climbing plants of Northern Telangana in India and their ethnomedicinal and economic uses. Indian Journal of Plant Sciences. 3(1): 86-100.

Tripathy PK, Kumar S and Jena PK. (2014). Nutritional and medicinal values of selected wild cucurbits available in Simlipal Biosphere Reserve Forest, Odisha. International Journal of Pharmaceutical Sciences and Research. 5(10): 5430-5437.

Tripathy PK, Kumar S and Jena PK. (2015). Comparison of antibacterial activities of some selected wild cucurbits collected from Similipal Biosphere Reserve. Plant Science Research. 37(1&2): 18-23.

Ummalyma SB, Devi RS and Kumar S. (2018). *Dioscorea hispida* Dennst. (Dioscoreaceae): a new addition to the state flora of Manipur, India. Pleione. 12(1): 147-149.