

## Palmyra Palm (*Borassus flabellifer* L., Arecaceae) as a Valuable Resource for Livelihood Security in Odisha, India

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Received August, 2021; Revised November, 2021; Accepted November, 2021

### Abstract

The present study (April 2015 to March 2018) is carried out to document and enlist the indigenous utilization pattern of Palmyra palm (*Borassus flabellifer* L.) in coastal districts of Odisha, India. The purpose of the research is to explore multipurpose use of Palmyra palm with the aim to suggest for proper marketing of the products which provides livelihood support to the rural people of Odisha. Exploratory assessment is made through field survey, literature consultations and key informant interviews. Various plant parts such as root, stem, leaves, inflorescence, seed, and fruit are used for various purposes including food, beverage, fiber, medicinal, and timber. This plant has been instrumental for indigenous people in providing a substantial livelihood through their own indigenous wisdom from collection to the processing of products. Certain measures for its better utility are suggested.

**Keywords:** Artisans; coastal districts; palm leaf manuscript; talagaja; traditional knowledge.


### Introduction

*Borassus flabellifer* L. belonging to the family Arecaceae is one of the important palm species termed as 'Tala'in Odia, 'Tar' in Hindi, and Palmyra Palm in English. It is also simply called as 'Palmyra', derived from the Portuguese word 'Palmera'. The tree was named originally for the resemblance of its leaf to the palm of the human hand. The tree is mentioned as used for multiple purposes in the ancient epic 'Ramayana', 'Srimad Bhagabat Purana' [1] and in holy 'Ramcharita Manasa' [2]. It is also mentioned in the writing of Pannini (400BC), the ancient grammarian of Sanskrit as well as in 'Pali' Buddhist Canon (5<sup>th</sup> century BC). The Palm tree is 20-30 m. tall, leaves 20-30, fan-like at the crown and 1-1.5m across. It lives for more than 100 years without

any serious pests or diseases. The plant is dioecious while the flowering and fruiting occurs usually from March to April every year. The edible products like immature endosperm, mesocarp pulp, and tuberous seedling are obtained only from the female plant [3], while the sweet sap is extracted from the inflorescence of the male plant [4, 5]. The tree usually thrives in tropical and sub-tropical regions of the world [5, 6]. Archeological and historical evidence indicated the presence of *Borassus flabellifer* L. in Southeast Asia dating back at least 1500 years. It is believed to be originated in Africa, spread to South Asia and introduced into Southeast Asia through commercial routes and dissemination of cultures [7]. In fact, there is an area designated as palm belt which extends up to 45° on both sides of the equator. This belt involves three continents covering 13 countries in Africa, 5 in South America, and 10 in Asia [8]. In India, Palmyra palm is extensively grown in diverse geographic, soil and climatic conditions (coastal belt, agricultural margins, and wastelands) of Tamil

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Nadu, Andhra Pradesh, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Chhattisgarh, and Odisha [9]. The plant is commonly grown throughout the plains of Odisha. Although palms have played essential roles for both subsistence and emerging economies through commercial products, many of which are profoundly linked in local cultures, there are sporadic scientific studies and report on this species [4, 10] in India, while no exhaustive work has been done in Odisha. Hence this project was conceived and carried out from 2015-2018 to survey and analyze the multifarious economic utility of this species and its role in the sustainable development of the persons involved as well as the areas concerned.

## Material and Methods

### Study area

Odisha formerly called Orissa is situated on the eastern coast of India between the parallels of  $17^{\circ} 49'$  N Latitudes and meridians of  $81^{\circ} 27'E - 87^{\circ} 29'E$  longitudinal (Fig. 1 a). Bordered on the north by Jharkhand, on the west by Chhattisgarh, on the south by Andhra Pradesh, on the north-east by West Bengal and on the south-east by Bay of Bengal with a coastline of 482km, state covers an area of 155,707km<sup>2</sup>. It contributes 4.87% of the country's land area. The state has a total population of 4.2 crores (2011 census) those who live in 51349 villages and 138 urban centers. Moreover; there are 62 types of scheduled tribe (22.85%) and 93 types of the scheduled caste (17.13%) communities, those who mostly live in hilly and rural areas of the state earning their livelihood from their age-old traditional practices. Among them, there are two specific types of people belonging to the scheduled caste community namely 'Chamar' and 'Pana' whose

livelihood is closely associated with the Palmyra palm plant. When the 'Chamar' community people have the expertise to climbs up the tree for trapping the sap and collection of palm fruit as well as palm frond, the 'Pana's utilize the long petiolar portion of the leaf for making fiber and other usable products out of it.

### Data collection

Extensive field survey was conducted from April 2015 to March 2018. Specific areas of ten coastal districts of the state mainly Balasore, Bhadrak, Jajpur, Kendrapara Jagatsinghpur, Cuttack, Puri, Khurdha, Ganjam, and Gajapati (Fig.1b) where there was more concentration of Palmyra palm were selected for the present study. Information concerning the presence of those specific groups of people there and utilizing the parts of the Palmyra tree was collected with prior visits to the sites. Help and assistance of the village heads as well as some guide cum language interpreter was solicited and the people dealing with Palmyra palm utility were interviewed to get relevant information. Information on the utilization of Palmyra palm were collected through semi-structured questionnaires, complemented by free interviews and informal conversations according to Martin (1995) [11] and Huntington (2000) [12]. Personal interviews and group discussions were made in the local language. Ninety three persons were interviewed. Queries were made about the collection of raw materials, selection, and mode of utilization of various parts of the plant. The necessary data were recorded. Finished products from the artisans' workplace and some weekly village markets were photographed and the process of working the articles was also keenly observed.

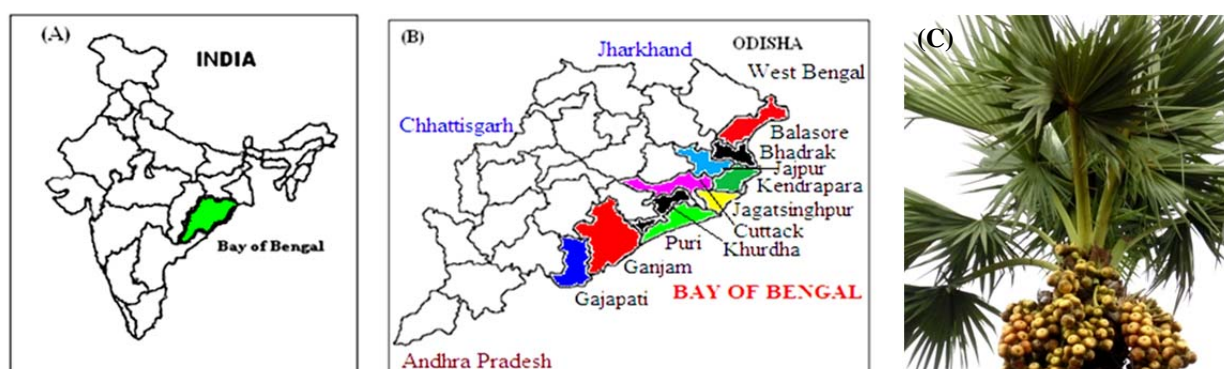


Figure 1. (A) Map of Odisha state in the eastern region of India, (B) Study area showing different districts, (C) Palm tree

## Results and Discussion

The link between plant and human societies has brought several uses of plants developed through trial and error method as well as by the imaginative mind of the indigenous people world over [13,14]. The plant diversity and the associated traditional knowledge have been emphasized since the Rio Convention on Biological Diversity [15]. Similarly, Palmyra palm's (Fig. 1c) multifarious products and uses by the people of coastal districts are one such typical use of the plant. In the studied area, the paste of male inflorescence with black pepper powder was used as a contraceptive, and root paste is used for the

prolonged menstrual cycle. Similarly, Balamurugan *et al.* (2018) [16] and Panda *et al.* (2018) [17] reported the same findings. Indigenous peoples across the studied area depend closely on palms for food and construction material. The matured tree trunk was used to make 'Seni' (roof plate) and 'Rua' (rafter) of the thatched house, durable for a longer period. Long walking stick and small handy sticks were prepared, observed to be used by older people and morning walkers. Moreover, the main body of the common musical instrument 'Drum' and 'Takudi' a spindle to spin the thread was also prepared out of it (Fig.2a-e).



**Figure 2. Use of tree trunk of Palm (A) Logs strips of Palm, (B) Logs used in house, (C) Takudi, (D) Walking stick, (E) Drum**

Some of the uses of the present findings draw support from the studies of Depommier, (2003) [18], Aman *et al.* (2018) [9], and Sridevi Krishnaveni *et al.* (2020) [19]. The natural fibers extracted from Palmyra palm has strong acceptance in many applications. The petiole of the leaf which was around 3-4 feet long containing the coarse fiber was split longitudinally by the artisans. It was used as like a rope to bind the broom, basket, winnowing fan (Kula), biofencing, and construction of thatched houses (Fig.3a-e). The similar use of petiole and leaf blade is also reported [19]. It is often explored due to their eco-friendliness and availability in many regions [20].

There were numerous types of utility products prepared from the broad leaves of Palmyra palm, which varies from place to place in rural Odisha for thatching huts, making small mats (Chatei), long mats used as a bed or for packaging, small baskets named 'Bhogai', hand fans and Japanese style hand fans, decorative hats, varieties of traditional umbrellas, toys, crackers, horoscopes, traditional invitation card, small container are some of the important household articles made by the artisans from the palm leaves (Fig.4a- l). Numerous studies highlight the multiple uses of leaves similar to findings of this study [19, 21, 22]. Reasons for the multifarious use of leaf can be attributed to their greater size and durability, but



more importantly to their strength, suppleness, and ease of splitting imparted by their long parallel fiber and fibrovascular bundles. In addition, the usage of palm leaves for writing by some specific people in ancient Odisha is one of the typical uses of plants, unique to this region (Fig. 4m-o). It has helped in preserving the history and culture of the people of this state and also influenced the script, language, the then people's mode of thinking and creativity. Some of them are preserved and available for ready reference at Puri (*Srikhetra*), Jajpur (*Goddess Viraja Kshetra*) and Bhadrak

(*Nitai-Chaitanya* temple of village Chasakhand). In earlier days people used palm leaf manuscripts as a convenient writing material to communicate and to express Hindu and/or Buddhist sacred knowledge and ideas in written form [23]. It is one of the oldest medium of writing and important texts were written and circulated throughout South Asia, Central Asia, and Southeast Asia [24, 25]. A huge number of historic manuscripts are still extant (some estimates go as high as 30 million), but this constitutes a very small number of the manuscripts which might have once existed [26].



Figure 3. A-E Use of petiole in different articles

In few villages of Balasore, Bhadrak, and Cuttack districts, the sap was extracted from the male inflorescence by the 'Chamar' community people, for making a fermented alcoholic drink colloquially called 'Tadi' for intoxication. When not fermented, it was named 'Neera', claimed to be good for wealth and vigour. The sap was also used for the preparation of jaggery or palm candy in a lesser amount. But in comparison to 'Khajur' (*Phoenix sylvestris* L.) sap, Palmyra palm sap extraction for jaggery making was rare in Odisha. The fruits were edible and used in various stages of maturity. The young fruit in summer, the pulp inside (immature endosperm) of which was delicious was consumed (Fig. 5a). The endosperm of young fruit (60-70 days) fruit is widely consumed in different parts of India [8, 27, 28].

Ripe fruit (Fig. 5b) was sweet, either consumed raw or its juice was extracted, mixed with rice flour

to make 'Pitha' (cake) (Fig. 5c), porridge (bara), etc. The use of ripe fruit pulp with rice flour for ethnic food preparations is also reported [3, 29, 30]. The mature seeds germinate in Oct-Nov. containing soft, sweet, crunchy part locally called 'Talagaja' was extracted by opening the hard pericarp and eaten (Fig. 5d). It tastes like a sweeter water chestnut. Moreover, the matured seed is washed, cleaned and masks of various types are prepared for wall decoration (Fig. 5e). The present result draws support from the studies of Sridevi Krishnaveni *et al.* (2020) [19]. Over and above, in some of the villages of the study area, different parts of the Palmyra tree such as senescent leaves, leaf stalk, trunk, and dried fruits were used as a fuel source for cooking (Fig. 5f) which is similar to the findings of Depommier (2003) [18].





Figure 4. (A-J) Use of leaf in different products, (K) Leaf used in thatching, (L) Leaf used in packing, (M) Illustrated arts, (N) Palm leaf horoscope, (O) Palm leaf manuscript





Figure 5. (A-D) Use of palm fruit and seed, (E) Decorative arts, (F) Plant parts used as fuel

### Conclusions

Palmyra palm tree is observed to be invaluable for the specific community those who have the age-old expertise in processing and utilizing different parts of this plant to produce different cheap household articles. Thereby, this plant provides livelihood to those people. But, it is a matter of concern that these plant which grows automatically without any care, are reducing at an alarming rate, due to the expansion of roads, buildings, different industrial projects, etc. Hence steps should be taken for plantation and protection of Palmyra palm to provide livelihood opportunities to the rural mass as well as the small entrepreneurs. The palm leaf containers (Bhogai) used in temples to carry dry Prasad (offering to god) can be encouraged, which can be a better alternative to the polythene bags as they are easily biodegradable. The extracted sap colloquially called 'Neera' can be processed and marketed as a soft drink and the ripe fruit pulp, as well as the soft, tasty pulp of the young fruit, can also be processed and marketed. Proper training with modern technology, financial assistance to develop their infrastructure, as well as proper marketing of their products will help more earning opportunities to the rural people of Odisha.

### Acknowledgements

The authors wish to convey their sincere gratitude to the artisan of 'Chamar' community for their co-operation in providing indigenous knowledge during the course of field work.

### References

1. Padhy, S., & Dash, S.K. (2008). Plants used in Rama setu: An ethnobotanical analysis. *Ethnobotany*, 20, 138-143.
2. Sikarwar, R.L.S. (2014). Plants of the Shri Ramcharita Manasa. *Ethnobotany*, 26, 37-44.
3. Vengaiah, P.C., Murthy, G.N., Sattiraju, M., & Maheswarappa, HP. (2017). Value added food products from Palmyrah Palm (*Borassus flabellifer* L.). *Journal of Nutrition and Health Science*. 4(1), 105, <http://dx.doi.org/10.15744/2393-9060.4.105>
4. Bondya SL, Bodra P. (2014). *Borassus flabellifer* L. (Tala dare) Arecaceae- An integral component in the life pattern of Santhal tribe of Dumka district in Santala Pragana, Jharkhand, India. *Ethnobotany*, 26, 28-31.
5. Pipatchartlearnwong, K., Juntawong, P., Wonnapijit, P., Apisitwanich, S., & Vuttipongchaikij, S. (2019). Towards sex identification of Asian Palmyra palm (*Borassus flabellifer* L.) by DNA finger printing, suppression subtractive hybridization and de novo transcriptome sequencing. *PeerJ*, 7:e7268, <https://doi.org/10.7717/peerj.7268>
6. Dung, H.T.L., Wen-Chien, L., & Po-Hsien, L. (2020). Sustainable Processes and Chemical Characterization of Natural Food Additives: Palmyra Palm (*Borassus Flabellifer* Linn.) *Granulated Sugar. Sustainability*, 12(7), 2650, <https://doi.org/10.3390/su12072650>
7. Pipatchartlearnwong, K., Swatdipong, A., Vuttipongchaikij, S., & Apisitwanich, S. (2017). Genetic evidence of multiple invasions and a small number of founders of Asian Palmyra palm (*Borassus flabellifer*) in Thailand. *BMC Genetics*, 18, 88, <http://doi.org/10.1186/s12863-017-0554-y>
8. Sakulsathaporn, A., Wonnapijit, P., Vuttipongchaikij, S., & Apisitwanich, S. (2017). The complete chloroplast genome sequence of Asian

Palmyra palm (*Borassus flabellifer*). *BMC Research Notes*, 10, 740, <http://dx.doi.org/10.1186/s13104-017-3077-8>

9. Aman, A., Rajan, R., & Sinha, S. (2018). The Palmyrah palm (*Borassus flabellifer* L.): Overview of biology, uses, and cultivation. *Biomolecule reports*, 4, 1-5.

10. Vengaiah, P.C., Rabindra, B.D., Murthy, G.N., & Prasad, K.R. (2012). Jaggery from Palmyrah palm (*Borassus flabellifer* L.)- present status and scope. *Indian Journal of Traditional Knowledge*, 12 (4), 714-717.

11. Martin, G.J. (1995). *Ethnobotany: A methods manual*. London: Chapman and Hall.

12. Huntington, H.P. (2000) Using traditional ecological knowledge in science: Methods and applications. *Ecological Applications*, 10, 1270–1274, <http://dx.doi.org/10.2307/2641282>

13. Alb uquerque, U.P., Araujo, T.A., Ramos, M.A., Nascimento, V.T., Lucena, R.F.P., & Monteiro, M.J. (2009). How ethnobotany can aid biodiversity conservation: Reflections on investigations in the semi-arid region of NE Brazil. *Biodiversity Conservation*, 18, 127–150, <http://dx.doi.org/10.1007/s10531-008-9463-8>

14. Dahlberg, A.C., & Trygger, S.B. (2009). Indigenous medicine and primary health care: The importance of lay knowledge and use of medicinal plants in rural South Africa. *Human Ecology*, 37, 79–94, <https://doi.org/10.1007/s10745-009-9217-6>

15. Convention on Biological Diversity (CBD). (1992). Convention on biological diversity. United Nations.

<http://www.biodiv.org/convention/convention.shtml>; 1992

16. Balamurugan, S., Vijayakumar, S., Prabhu, S., & Morvin Yabesh, J.E. (2018). Traditional plants used for the treatment of gynaecological disorders in Vedaranyam taluk, South India - An ethnomedicinal survey. *Journal of Traditional and Complementary Medicine*, 8, 308-323, <https://doi.org/10.1016/j.jtcm.2017.06.009>

17. Panda, T., Mishra, N., Rahimuddin, S., Pradhan, B.K., Rout, S.D., & Mohanty, R.B. (2018). Folk medicine used for the treatment of gynaecological disorders in rural areas of Bhadrak district, Odisha, India. *Botanica*, 24(2), 132–142, <https://doi.org/10.2478/botlit-2018-0013>

18. Depommier, D. (2003). The tree behind the forest: ecological and economic importance of traditional agroforestry systems and multiple uses of trees in India. *Tropical Ecology*, 44(1), 63-71.

19. Sridevi Krishnaveni, T.R., Arunachalam, R., Chandrakumar, M., Parthasarathi, G., & Nisha, R.

(2020). Potential review on Palmyra (*Borassus flabellifer* L.). *Advances in Research*, 21(9), 29-40, <https://doi.org/10.9734/air/2020/v21i930229>

20. Srinivasababu, N., Suresh Kumar, J., & Reddy, K.V.K. (2014). Manufacturing and characterization of long Palmyra palm/ *Borassus flabellifer* petiole fibre reinforced polyester composites. *Procedia Technology*, 14, 252-259, <https://doi.org/10.1016/j.protcy.2014.08.033>

21. Kannan, M., Senthil Kumar, T., & Rao, M.V. (2016). Utilization of plant resources for non-medicinal purposes by Malayali tribes of Kalrayan hills of Salem District, Tamil Nadu, India. *International Journal of Herbal Medicine*, 4(1), 47-58.

22. Muthulakshmi, V., Shanthi, S., & Jayashree, G. (2018). Determination of bioactive compounds from seed coat of *Borassus flabellifer* Linn seed using phytochemical and GC-MS analysis. *World Journal of Pharmaceutical Research*, 7 (7), 196-204, doi: 10.20959/wjpr20187-11601

23. Bhoi, P. (2010). Scribe as metaphor: patterns of processing and writing palm leaf manuscripts. *Indian Anthropology*, 40, 71-92.

24. Dyke, Y.V. (2009). Sacred leaves: The conservation and exhibition of early Buddhist manuscripts on palm leaves. *The Book and Paper Group Annual*, 28, 83-97.

25. Kumar, D.U., Sreekumar, G.V., & Athvankar, U.A. (2009). Traditional writing system in Southern India — Palm leaf manuscripts. *Design Thoughts*, 2-8.

26. Wujastyk, D. (2014). *Indian Manuscripts*. In: Quenzer J, Bondarev D, Sobisch JU, ed. *Manuscript cultures: Mapping the field*. Boston, DeGruyter.

27. Rahmah, N.L., Hidayat, N., & Hajar, B.K. (2019). Glucosamine production from palmyrah (*Borassus flabellifer* L.) seeds (a study of precursor type and concentration). *IOP Conference Series: Earth Environmental Science*, 230, 012027, <http://dx.doi.org/10.1088/1755-1315/230/1/012027>

28. Rodiah, M.H., Jamilah, B., Sharifah Kharidah, S.M., & Russly, A.R. (2019). Physico-chemical and antioxidant properties of mesocarp and exocarp from *Borassus flabellifer*. *International Food Research Journal*, 26(5), 1469-1476.

29. Vengaiah, P.C., Vijaya kumara, B., Murthy, G.N., & Prasad, K.R. (2015). Physico-chemical properties of Palmyrah fruit pulp (*Borassus flabellifer* L.). *Journal of Nutrition and Food Science*, 5, 391, <https://doi.org/10.4172/2155-9600.1000391>

30. Siju, S., & Babu, K.K. (2020). Genetic resources of Asian palmyrah palm (*Borassus flabellifer* L.): a comprehensive review on diversity, characterization and utilization. *Plant Genetic Resource*, 18 (6), 445 – 453, <https://doi.org/10.1017/S1479262120000477>