



Plant Archives

Journal homepage: <http://www.plantarchives.org>
DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2023.v23.no1.051>

CARYOTA URENS L. : AN UNDERUTILIZED PALM FOR NUTRITIONAL SUPPLY & TRIBAL LIVELIHOOD IN BASTAR PLATEAU OF CHHATTISGARH INDIA

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(Date of Receiving : 10-01-2023; Date of Acceptance : 15-03-2023)

ABSTRACT

Sulphi (*Caryota urens* L.) is an underutilized Palm which provide traditional beverage consumed by our ancestor since long in Bastar division of Chhattisgarh and also some part of south Indian state. They make them using natural fermenting agent through traditional tapping methods. A survey study on Sulphi was conducted in 40 villages of 4 different blocks of Bastar district in Chhattisgarh. To collect the information, the study area divided in to cluster-I to cluster-IX and analyzed the findings. The results revealed that the local communities consumed them to rid from tiredness as well as a traditional beverage having food, socio-cultural and economic values, they also use the fermented sap against diseases and disorders. The paper highlights nutritional and economical values of Sulphi for local communities of Bastar. *Caryota urens* L. sap is well known as Bastar Bear in Bastar as well as whole state of Chhattisgarh and it possesses antioxidant activity.

The present results also revealed that the incorporation of *Caryota urens* L. palms by tribal and forest fringe communities of Bastar in own farmyard or backyard /farmland/home garden farming systems not only benefit the small, medium farmers by improving livelihoods, but also provide additional sources of income. Therefore, *Caryota urens* L. considered to be Kalp Vriskha in the Bastar division of state, they form a vital component of forest and agricultural ecosystems, providing greater range of economic value by providing a significant source of income at the local level.

The average income generated from different clusters of all blocks of Bastar district was recorded Rs 63,701.35 per year. Whereas, maximum income were reported from Cluster- I which was Rs. 88,035.70 per year followed by Rs 68,471.42 from Cluster-III, Rs. 67,150.00 from Cluster- VII and minimum income per year reported from the Cluster-VI which was Rs. 46,714.20.

Keywords : Bastar, Sulphi, Bastar bear, Sap, Jaggery, Tribal, Fermentation, Beverage etc.

Introduction

Caryota urens L. is an underutilized palm belong to the family Arecaceae which is native to low land forests of tropical Asia including India, Malaysia and Indonesia. It is popular as Kithul, Jaggery, Treacle and Toddy (Fermented beverage) are produced from sap of the young inflorescence of *Caryota urens* in Sri Lanka. In India, stem starch of *Caryota urens* represents a food source among some tribal peoples (Wimalasiria *et al.*, 2016). Inflorescence sap of *Caryota urens* and sap based products possess health promoting properties, according to folkloric knowledge and are used in treatments in the ayurvedic medical system practiced in India. *Caryota urens*, commonly known as Fishtail palm or Indian Sago and locally as Sulphi in Bastar Plateau agro climatic zone of Chhattisgarh. Stem is strong and durable, used for building huts, agricultural implements, etc. the most important produce from this tree is sap extracted from the stem which is very famous as Bastar Bear in Bastar as well as whole Chhattisgarh. Fresh toddy from this tree is very nutritious and is recommended to tuberculosis patients by traditional healers in Bastar. Toddy

is extracted from the inflorescence, and is considered somewhat powerful compared to toddy extracted from few other palm trees. The heart of the trunk contains a starch similar to sago (sabudaana). Pulp of the fully grown up plant is cut, sun dried, powdered and is edible with sweet in taste. The sap extracted from the inflorescence of the plant is used to make sugar and alcoholic beverages. Sap collected from the inflorescence is fermented with a crude, mixed inoculum of yeast to obtain toddy. This beverage can be distilled, as is coconut toddy, to prepare a more concentrated spirit in south India. The mature wood in the outer portion of the stem is strong, heavy and durable. The stem yields an inferior timber sometimes used for construction purposes, especially in traditional buildings, for purposes such as planking, flooring, rafters, roofing, partitioning and fencing, and also for making spears. Polished stems are used as monoliths in modern houses.

Traditional healers of Bastar told freshly collected Sulphi sap is having many health benefits. Sap harvesting was revealed that tapping of the *Caryota urens* for sap production started from October and continued to mid June

for approximately 273 days in the winter season. In the 273 days, palm is tapped in every day morning and evening sap production. Palms aged 20-30 years growing in the field and in the axils produced the most sap. Sap harvesting timing sap is harvested 2 times in a day i.e. morning and evening (Patel and Nema, 2021). The *Caryota urens* is among the most popular plants in tribal dominated area i.e. Bastar, it is one of the most important flora of the tribal society from the utility point of view in the form of fermented beverage, jiggery and as medicine too, it is also one of the preferred plant in the farmers field for livelihood and socio-economic stoles point of view in the society of study area. Sulphi tree generates high income from less effort and less man power. Sulphi tree is worshipped in Bastar as religious tree and very popular among the tribal communities, in Gondi language, it is called as "Gorga" and "Akashpani". Looking to the importance of this species, the present study was conducted in the Bastar district of Chhattisgarh.

Material and Methods

Study area: The present work was conducted in 40 villages of 4 different blocks namely Bastar, Lohandiguda, Tokapal and Jagdalpur in Bastar district of Chhattisgarh, India during year of 2021-22. To collect the information related to Sulphi study area classified in to cluster-I to cluster-IX and analyzed the findings. The study deals with aspects of income from *Caryota urens* for tribal population at southern Bastar Plateau

agro climatic zone of Chhattisgarh. Bastar division is situated in the southern part of Chhattisgarh, biogeographically; it is included in the Eastern Highlands (6C) province of the Deccan Peninsula bio geographic zone of India (Rodgers *et al.*, 2002). Maximum part of the study area belongs to the undulating Deccan-trap Plateau with altitude ranging from 200 m to 1200 m asl. The Bastar plateau falls in the Dandakaranya physiographic provenance of Chhattisgarh located to the south of Mahanadi Basin. At present, Bastar plateau comprises seven districts viz., Uttar Bastar-Kanker, Kondagaon, Narayanpur and Bastar (Jagdalpur), Dakshin Bastar-Dantewada, Bijapur and Sukma etc. under one administrative division head located at Jagdalpur, a well developed city and connected by roads, trains and airways. Whole Bastar division is dominated by 70 % tribal population having unique and specific socio-cultural diversity. Another uniqueness of Bastar is rich and diverse flora in wild therefore, depend large population in forest and their produces for livelihood and economy. The vegetation of Bastar can be classified into three broad types viz. Sal dominated, Mixed and Teak dominated. According to Champion and Seth (1968) Forest type of Bastar can be grouped into following classes: (i) Sal forest - 3C/C2e Moist peninsular Sal (ii) Mixed forest - 3B / C2 Southern moist mixed deciduous forest (iii) Teak forest - 3B / C1c- Slightly moist teak forest.

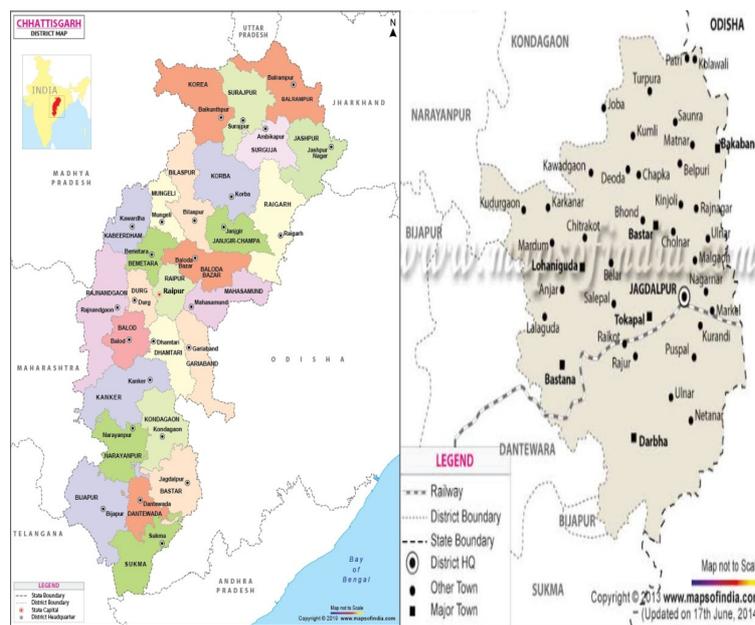


Fig. 1 : Map of Chhattisgarh state and study area

The climate of Bastar is more or less pleasant. Like rest of India, four different seasons are observed throughout the year. The mean annual rainfall is about 1500 mm. The annual average minimum temperature is 19°C. Whereas, maximum temperature is 31°C. The months of April and May are generally uncomfortable due to the hot and dry weather. According to All India Soil and Land Use Survey, 1976, the soil of Bastar plateau can be classified as Zonal-Red Sandy Soils. They are the product of the weathering of the granite; coarse grained granites, quartzites, and sand stones etc. and banded iron formations. The core area of the plateau contains mostly moderately deep laterite and all the

hill slopes are well stocked generally with mixed forests and bamboos. On the lower slopes and along the valleys where there is deposition of alluvium, Sal forests are found. The top of the hills which are usually flat contains shallow lateritic soil, and they are generally blank and stocked with stunted tree growth and xerophytic shrubs.

Method of data collection from study area: The field survey was conducted in forest villages of all the blocks of Bastar district (viz., Bastar, Lohandiguda, Tokapal and Jagdalpur). The methodology is following as under 1) Field survey 2) Literature collection.

To collect the information related to Sulphi study area classified in to cluster-I to cluster-IX and analyzed the findings. To fulfill the objective of study we conducted intensive field survey of 40 randomly selected villages from

all the four blocks of the district and information related to *Caryota urens* L. was collected through well prepared questionnaire as well as through direct interview of respondents.

PHOTO PLATE NO. 1
Sulphi Sap Collection Method by Local Population in Bastar



Results and Discussion

Nutritional composition and importance of *Caryota urens* L.

Trees are the gift of nature; trees are the heaven in this world, the increasing new inventions increase new diseases, so the mankind should learn the disease and drugs for cure.

Caryota urens which name gets because of the presence of stinging chemicals known as ‘Urens’ in the fruit. The sweet sugary sap obtained from the inflorescences of the *Caryota urens* is of great economic importance in the study area where growing in farmyard or backyard/farming land by the tribal and rural population of Bastar division. The sap derived from tapping the inflorescence of the palm is called toddy, a

fermented native intoxicating beverage. The sap on fermentation by air borne yeast and bacteria becomes palm wine and is one of the famous popular alcoholic beverages in the life among the local people of most of the South Asian countries where these palm grow extensively. Chandrasekhar *et al.* (2012) studied confirmed similar results in Bastar division of the Chhattisgarh. Phytochemical properties of the *Caryota urens* L. alkaloid, flavonoid, carbohydrate, organic and inorganic compounds are present in Sulphi tree. The presence of oxalic acid proved the *Caryota urens* fruit contain crystal structure organic compound known as calcium oxalate crystals which are a skin and membrane irritant and not edible. Protein and amino acid are absent reported by Vaishnavi and Suneetha, (2013).

The fresh unfermented palm sap is very sweet and has exceptional nutritive value because of the existence of substantial amount of minerals and vitamins (Theivendirarajah, 2008). The fresh sap is consumed immediately as a refreshing non-alcoholic drink by the locals as well as tribal of study area. It can be processed to produce diverse food items such as treacle, sause, syrup and jaggery (Chandrasekhar *et al.*, 2012). All the sap products have a very high demand because of their natural origin and the organic food production techniques. However, these products are very expensive due to the scarcity in production and the higher demand due to the specific taste and aroma and due to the potential medicinal value (Ranasinghe *et al.*, 2012). *Caryota* sap provides a significant source of income to a huge population living in the rural areas of the Bastar where these palm is widely spread. Confirmed the findings by Ranasinghe *et al.*, (2012) and Somasiri *et al.*, (2011) whose reported that the *Caryota* sap provide a significant source of income in developing countries. Therefore, scientific knowledge of the functional properties of fresh sap of this palm would help to improve the value, quality satisfactory consumer taste etc.

In Ayurveda recommends the use of *Caryota urens* for seminal weakness and urinary disorders, the juice is applied on the forehead for hemicranias. In traditional medicine porridge prepared from *Caryota urens* flower is used to treat gastric ulcer, migraine and headaches (AICRP, 2014). *Caryota urens* species are known as Sugar palm also, which is used in ancient medicine to treat hemicranias and rheumatic swelling. The sap of this palm is sweet in nature, so it is used to produce sugar which is known as jaggery (Suneetha & Bishwambhar, 2013; Bishwambhar & Suneetha, 2013; Bishwambhar & Suneetha, 2012; Patel & Ramana Rao, 2011 and Indrajit, *et al.*, 2011). Ancient medicine technologies recommend these flowers of the trees are used as a home remedy and improve the hair growth. Bastar Beer or fermented beverage (Sulphi) is traditionally believed to be health benefits as antiageing, antihyperglycemic in nature due to antioxidant properties (Ranasinghe *et al.*, 2012; Wimalasiria *et al.*, 2015). Toddy or fermented beverages are widely used in Ayurvedic and folklore medicines in Sri Lanka and India (Manithottam and Francis 2007; Wimalasiria *et al.*, 2015). Toddy is used to cure Spermatorrhoea in Orissa (Prusti & Behera 2007). Sap is used as medicine for stonic poison (Charles *et al.*, 2011; Kumar *et al.*, 2012). Sulphi sap and toddy is consumed to

control the body temperature during hot summer months (AICRP 2014). Tender flowers are used as a home remedy to promote hair growth (Orwa *et al.*, 2009; Charles *et al.*, 2011).

Bastar Beer in Chhattisgarh (Shukla and Viswakarma, 2011). People of Bastar used as energy, revitalize and soft drink before sunrise it act as medicine (Kumar *et al.*, 2012; AICRP 2014). Viscous golden syrup (Treacle) with delicious flavor often served with buffalo milk curd in Sri Lanka (Dissanayake, 1977; Zoysa, 1992). The fresh sap is sweet in nature but after hours begins to ferment and becomes whity sour tasted toddy. Sweet sap and fermented beverages are predominant drink in all social and ritual functions such as temple festival, birthdays, marriages, and other meetings, etc by the tribal and forest fringes people of Bastar area, this is also confirmed by several researchers in their work (Manithottam & Francis 2007; Kumar *et al.*, 2012; Wimalasiria *et al.*, 2015). Sap is boiled and make as jaggery or brown sugar (Zoysa 1992; Kulkarni and Mulani 2004; Ranasinghe *et al.*, 2012; Nath *et al.*, 2015). The sap contains 16% sugar an adult tree can produce 110 kg of sugar /year reported by Dalibard (1999) and Kumar *et al.*, (2012).

***Caryota urens* L. as an income generator and livelihood Booster through Tapping in study area**

Among Indian Palms, *Caryota urens* L. has an important role in livelihood of tribal and forest fringe communities (Renuka *et al.*, 1996; Kumar *et al.*, 2012). *Caryota urens* are considered to be Kalp Vriskha in the Bastar division of Chhattisgarh (Kumar *et al.*, 2012; AICRP 2014). They form a vital component of forest and agricultural ecosystems, providing greater range of economic value by providing a significant source of income at the local level (Kulkarni and Mulani 2004; Ranasinghe *et al.*, 2012). The *Caryota urens* provided plentiful Sap which was the chief source of income for their life (Naik, 2013).

Tapping Method: Tapping is a technique that is used to collect sap from Sulphi tree. According to Johnson tapping has a long history and is a pan tropical activity. This practice is believed to have originated roughly 40 years ago in India sap extraction is very common and is technically advanced in Asia and the pacific islands. In the study area we observed tapping operation was to be started at the onset of winter by series of pruning usually two times and collect the Sulphi sap at morning and evening in daily basis, average collection of sap were 15-20 liter par day/tree were observed during the study period. The tappers skill lies in maximizing the sap flow to the inflorescence while retarding flower extension. When a palm is about to flower, the inflorescence becomes visible in the tree top and after two month a young inflorescence first emerges; the tapper climbs the palm and carefully removes the outer layers of the sheath or spathe protecting the flowers. Tappers say that the number of layers indicates the number of individual flowers to come from the inflorescence, it ranged from one to twelve. The tapper makes a roughly 15 cm long, 5 cm wide, and 2 cm deep incision in the side of the flower with the help of special seizer like knife. Generally sap is collected from one side of the Sulphi in one season and the successive season sap must be collected from the upper opposite side of the previous cut (Patel & Nema, 2021).

Table 1 : Comparison of nutritional values of other wild edible plants

Parameter	<i>Caryota urens</i>	<i>Gmelina arborea</i>	<i>Bauhinia recemosa</i>	<i>Zanthoxylum rhetsa</i>	<i>Oroxylum indicum</i>
Non reducing sugar (g/100 g of DW)	0.1072	0.053	0.0161	0.0558	0.0556
Reducing sugar (g/100 g of DW)	0.1872	0.2041	0.203	0.1836	0.1558
Total sugar (g/100 g of DW)	0.2944	0.2572	0.2193	0.2375	0.2102
Starch (g/100 g of DW)	0.8772	0.969	1.1045	1	0.9576
Total carbohydrate (g/100 g of DW)	1.1716	1.2335	1.3238	1.258	1.1766
Energy (kcal/100 g of DW)	19.5657	20.59	22.1074	20.674	19.6492
Crude protein (g/100 g of DW)	3.125	2.4375	1.375	4.518	4.1612
Moisture (% in fresh weight)	62.1	94.2	76.3	89.4	77.9
Dry matter (% in fresh weight)	37.9	5.8	23.7	10.6	22.1
Crude fat (% in DW)	1.5	1	0.9	3.8	2.3
Crude fiber (% in DW)	7.93	7.68	7.69	6.23	8.84
Total ash (% in DW)	10.39	18.16	6.24	6.34	9.4
DW: Dry Weight Basis					
Source: Shivprasad et al., (2016)					

Table 2: *Caryota urens* Average population, age, height and their sap production in Southern Bastar Plateau of Chhattisgarh state

Name of Block	Family Members	Average number of tree available	Average age of tree (in yrs)	Average age of tree used for sap collected (yrs)	Average tree height (ft)	Average Sap collection (in lits/day)	Annual income (Rs.)
Cluster-I	6.1	1.57	18.80	18.40	26.10	13.8	88,035.70
Cluster -II	6.6	0.85	18.00	19.80	104.40	11.2	60,560.00
Cluster -III	6.7	1.25	21.62	19.25	25.87	11.5	63,075.00
Cluster -IV	6.7	1.66	21.80	16.90	25.80	12.9	68,471.42
Cluster -V	6.4	1.50	22.00	17.80	28.50	12.9	65,378.57
Cluster -VI	6.4	1.20	22.80	18.00	27.00	10.7	46,714.20
Cluster -VII	6.5	1.60	24.10	17.90	25.60	11.9	67,150.00
Cluster -VIII	5.7	1.40	22.40	16.90	25.40	11.5	57,727.27
Cluster -IX	6.0	1.00	22.40	17.20	26.40	10.9	56,200.00
Average	6.3	1.34	21.55	18.02	35.01	11.92	63,701.35

Sap yield can reach a maximum just before flowering and fruiting Pethiyagoda suggested that a rapid increase in respiratory rate occurs during this period. This phenomenon may accelerate conversions of resaves into nutrients and the transfer rate of sap flow to growing points. In general, tapping methods are classified as destructive or non destructive. We noticed in present study destructive tapping triggers were used due to this tapped palm was dead after some time in study area. (Portères, 1964) studied the destructive techniques are usually practiced on the terminal bud tapping of *Borassus aethiopiund* and are often responsible for the death of the tree within a few months.

The traditional healers of Bastar told freshly collected Sulphi is having many health benefits and sap collection was higher quality in the morning as compared to the evening because in night, it was collected whole night in the vessel. The present study reported more than 35% family have Sulphi tree in their backyard, home and in their farm land. Study also reflect only mans were involved in the collection and extraction of sap from tree, women were not involved because of rituals of tribal. During the survey, it was reported that only one man is allowed to collect sap from a single family, believed by tribal community that if other person will extract the tree stops sap production. If fermentation by the airborne bacteria and fungi is allowed, the collected phloem sap of the palms will be converted into intoxicating fermented beverages such as toddy and alcohol (Ranasinghe

et al., 2012; Somasiri et al., 2011; Chandrasekhar et al., 2012). Though the fresh saps of the palms are free of fermentation and highly charged with sugar, they become rich in alcohol and acids by the natural fermentation process.

Several methods are practiced in Asian country to prevent such fermentation taking place in the saps of the palms in order to get the sweet sugary sap which is of great economical importance for the local people. It is reported that the amount of sugar in the sap is comparatively higher in the female trees. Season of the year of sap collection, environmental factors, sex of the palm tree used to collect are among the factors that might influence the inhibition of fermentation (Ranasinghe et al., 2012; Shamala & Sreekantiah, 1988; Somasiri et al., 2011). Women are commonly engaged in processing of sap into other products with following steps. First tapped sap are filtered and poured in hot pot. When foam begins it is skimmed off with long handled wooden spoon till removes the foam and then added small quantity of toddy while maintaining keep low fire for sometimes. It is poured in wax sealed container and cools down for making syrup. For making jiggery further boiled in low flame with stirring up to suitable viscosity. Then poured in a half shell coconut molds or white cloth spread in the sand with small desired shaped holes and keep it drying in the sunlight for desired moisture content (Zoysa 1992; Everett 1995).

In the present study table no. 2 showed the average income of farmer having average Sulphi tree of 1.34 generated from different clusters of study area in Bastar district was recorded Rs 63,701.35 per year through the selling of 11.92 liters sap per day. Whereas, maximum income was reported from Cluster-I which was Rs. 88,035.70 per year followed by Rs 68,471.42 from Cluster-III, Rs. 67,150.00 from Cluster- VII and minimum income per year reported from the Cluster- VI which was Rs. 46,714.20 in the study area. Kumar *et al.*, (2012) reported in their study farmer having 1 to 2 Sulphi tree in their field, they could earn average income Rs. 40,000 to 50,000 per annum in Bastar, Chhattisgarh. The single palm yields around 100-150 kg of pith (CSIR 1992). Further it's successfully utilized for production of biscuits, noodles, sago pearls and desserts in Malaysia (Rajyalaksmi 2004). Yield of sago is higher in palm than any other starch sources (Jong 2000). Stem apices of Sulphi palm are chewed raw or cooked as a delicacy by the natives of Chhattisgarh (Orwa *et al.*, 2009). In India, kitul palm witnessed in home gardens of Kerala and Chhattisgarh (Renuka 1999; Kumar *et al.*, 2012). On the basis of information gathered from socioeconomic survey were recorded, results revealed that the tribal population of Bastar are not totally dependent on Sulphi. It is found only 47 % tribal people realize the dependency on Sulphi, reason behind it Sulphi tree produced sap between 15-20 years of its establishment/development and after the secretion of sap, the plant is dried and finally dead.

During the present study we also observed the collection and marketing of Sulphi sap is not done in an organized manner as compared to other non wood forest products and the selling is confirmed in rural as well as urban areas only in study area. Therefore, Sulphi trees play a significant role in rural and tribal life, they are well known about Sulphi which is very important to their livelihood. It is found that *Caryota urens* in commonly traditionally planted by tribal communities on their home yard, agriculture land and farms etc. Discussion with tribals/villagers information outcome about sap is sometime used for Urinary and stomach disorder of human being and leaves are used for thatching of tribal huts for their livelihood accepts as beverage. The main product is the sap obtained from tapping the inflorescence, which drunk immediately or be processed into sugar or be allowed to ferment for a few hours to become wine /liquor. The people of all the study villages of Bastar division were Sulphi is cultivated in tribal's home yard/boundary lands for its sap as beverage/drink. The consumption pattern of Sulphi sap among the tribal people was highly consumed by male as compared to female population of study area.

Conclusion and Recommendations

Sulphi (*Caryota urens*) tree provide staple and supplement food beverage for local communities of Bastar who make them using locally available or planted in own farmyard or backyard. The present study highlights nutritional and economical value of Sulphi in Bastar division of Chhattisgarh state. The value addition and scientific validation on their produce and medicinal values are needed. Research work on preservation of Sulphi sap needed because it can't be stored for more than 24 hours, it deteriorates with time. Proper nutrient management and proper care should be encouraged as most of the trees stops production in maturity. Proper training and processing of jiggery from the sap should be given to Sulphi collectors as there were lack of methods,

thus it will help in extra income and creating more employment.

Acknowledgment

Authors are thankful to the Hon'ble Vice-Chancellor, Shaheed Mahendra Karma Vishwavidyalaya, Jagdalpur, Chhattisgarh for his encouragement and support during the study period. The authors are also cordially grateful to the traditional healers of Bastar district and all the respondents because of their kind support and cooperation in sharing their knowledge during the field surveys.

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