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Micro-hotspots of medicinal plants in KBK districts of Odisha, India

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ABSTRACT

India is one of the 17 mega diverse countries, covering only 2.4% land area of the world. The country is highly populous. With nearly 46000 plant species including 15,000-18,000 higher plant species besides thousands of algae, lichen and fungi and 81 thousand animal species, the biodiversity of India is very rich. In addition to the two mega diversity hotspots reported earlier, 24 more micro-hotspots have been reported within India. However, several other micro hotspots can also be proposed based on biodiversity inventories and floristic analysis done by the scientific workers from various part of the country. During the present work, 7 micro hotspots in KBK region of the state of Odisha have been identified on the basis of the presence of rare and endemic medicinal plant species as well as taxonomically interesting species facing threat due to habitat loss, over-exploitation and other biotic factors. .

1. Introduction

India is one of the seventeen mega-diverse countries. With only 2.4% of world's land area, it accounts for 7-8% of the recorded species of the world. It provides habitat to more than 46,000 species of plants and 81,000 species of animals and thousands of algae, lichen and fungi (Anonymous, 2012). Earlier, Myers (1988) had identified 18 hotspots all over the world in which many of the rare plants and animal species are found. Subsequently, the number was increased to 25 (Myers *et al*., 2000). These hotspot areas are mostly found in 17 mega-diverse countries. Among the 25 hotspots of the world, the Western Ghats and the Eastern Himalayas extending over to Andaman–Nicobar Islands have been recognized as the two mega diversity hotspots of India. In subsequent years, 24 more areas termed as the "micro-hotspots" have also been identified in India. Although, Tirupati-Tirumala hills, Visakhapatnam hills spreading over Seemanchalam and Arakoo valley lying in Eastern Ghat are included in these micro hotspots (Myers *et al*., 2000) none of the floristically diverse spots of Odisha state does figure in this list despite the fact that the state of Odisha in general and KBK region in particular are quite rich in terms of plant biodiversity.

The Eastern Ghats, consisting of a discontinuous range of mountains along India's eastern coast extends over 1750 km with an average width of about 100 km and lies between 77^0 22' to 85^0 20' E longitude and 9^0 95' to $20^0$74' N latitude (Panda *et al*., 2013). Much older than Western Ghats, the Eastern Ghats are located at a high level than the former. The Ghats passes through the states of Odisha, Andhra Pradesh Tamilnadu and a portion of Karnataka. The vegetation and flora of Eastern Ghats region is quite rich and diverse where more than 3200 species of angiosperms are reported, constituting about 16% flowering plants of India as recorded in Flora of Odisha (Saxena and Brahmam, 1994-1996). But unfortunately, none of the region of the

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state of Odisha has ever been considered as micro-hotspot despite the fact that 36% area of the eastern ghat belongs to the state of Odisha and incidentally major KBK districts such as Koraput, Malkangiri, Rayagada, Kalahandi and hilly areas of Bolangir district, particularly Gandhamardan hill range comes under this Eastern Ghats region. On the other hand, due attention has yet not been given to the vegetatiom analysis of the Eastern ghats in general and medicinal plants in particular (Pandey and Sukla, 2003).

2. Material and methods

In view of the fact that none of the floristically rich areas of KBK districts constituting of a part of famous Eastern Ghats is included in 24 micro hotspots, identified in the second phase, we could identify seven different locations having rich and diverse medicinal plant diversity during the course of our study and suggested to consider them as new micro hotspots on the basis of established scientific criteria. These spots were selected in view of their inaccessibility and having half of the rare and endemic medicinal plant species of the state. The rare plants collected from these areas were identified with the help of flora of Odisha (Saxena and Brahmam, 1994-96).

3. Results

During the present study, seven micro hotspots have been identified (Fig. 1). In the course of investigation, the occurrence of rare and endemic medicinal plant species in such habitats, their density and pattern of distribution and level of exploitation etc. have been emphasized. Those places are Deomali hills and Gupteswar of Koraput district, Khairput–Bonda hills of Malkangiri district, Niyamgiri hills of Rayagada district, Nrusinghnath-Harisankar complex of Bolangir –Baragarh district, Karlapat of Kalahandi and Sunabeda plateau of Nuapada district.

3.1 Deomali hills

Deomali (1672 m), the highest mountain peak in the state of Odisha, is situated in the Koraput district of Southern Odisha which is a part of Chandragiri - Pottangi mountain system belonging to Eastern Ghat. The hills are inhabited by a number of tribals in which Kondh and Sabar tribe communities are numerically rich. In the absence of modern medical facilities in these remote areas, they have been using plants for cure of various diseases and their knowledge of plants may be termed as highly evolved. Because of its rich plant diversity and extraction pressure of endemic, endangered and rare species with medicinal potentials for traditional use (Das and Mishra, 1987), this area needs indepth study and has to be conserved as a future micro hotspot for medicnal plants. Some of the species are very specific to these hills and are not found elsewhere in the state. Of many such plant species, few important species are enumerated below;

i) *Habenaria grandifloriformis* Blatter & Mc Cann. (Syn. *H. grandiflora* Lindl.ex. Hook.f.)

This is a small terrestrial herb, belonging to the family Orchidaceae and found scattered in grassy plateau and hill tops of Deomali. Whole plant is used for treating swelling and internal pain.

ii) *Solanum erianthum* D. Don.

A large unarmed shrub belonging to family Solanaceae, found occasionally in foot hills of Deomali at Pottangi locality. The local name is Orso or Donka bejji. Fruit is used in killing worms in stomach.

iii) *Vigna vexillata* (L.) A. Rich.

A trailing herb belonging to family Fabaceae, found in Pottangi area in the foot hills of Deomali. Plant parts are used for cholera and ulcers.

iv) *Pueraria tuberosa* (Willd.) DC.

A large woody climber with tuberous roots, tubers sometimes attaining enormous size. The plant belongs to Fabaceae family, locally known as ‘Mada tunga’ and Odia name is ‘Bhuin kakharu’. The root tuber is used in reducing abdominal pain.

3.2 Gupteswar

Gupteswar is a place of natural beauty harbouring rich biodiversity and it runs through a forest tract from East of Ramgiri hills upto a distance of 15 km through thick Sal forests. There is a cave famous as the abode of Lord Shiva. Situated almost 40 kilometers to the South West of Jeypore, it is still a virgin patch of forests for land explorers. People from different walks of life in general and Vaidyas in particular have visited this place in search of medicinal plants. Since this region is well protected by the State Forest Department, a good number of rare plants are still conserved and human inference is greatly restricted. This area is proposed to be a micro hotspot of medicinal plants for further exploration. The major ethno medicinal plants found here are;

i) *Cissus repens* Lam.

Locally known as ‘Panibel’ amongst Kondhs, this is a weak, glabrous, succulent trailer of Vitaceae family, found frequently in Ramgiri- Gupteswar area. Root tuber paste is used for healing of bone fracture and also applied externally on rheumatic joints to get relief from pains.

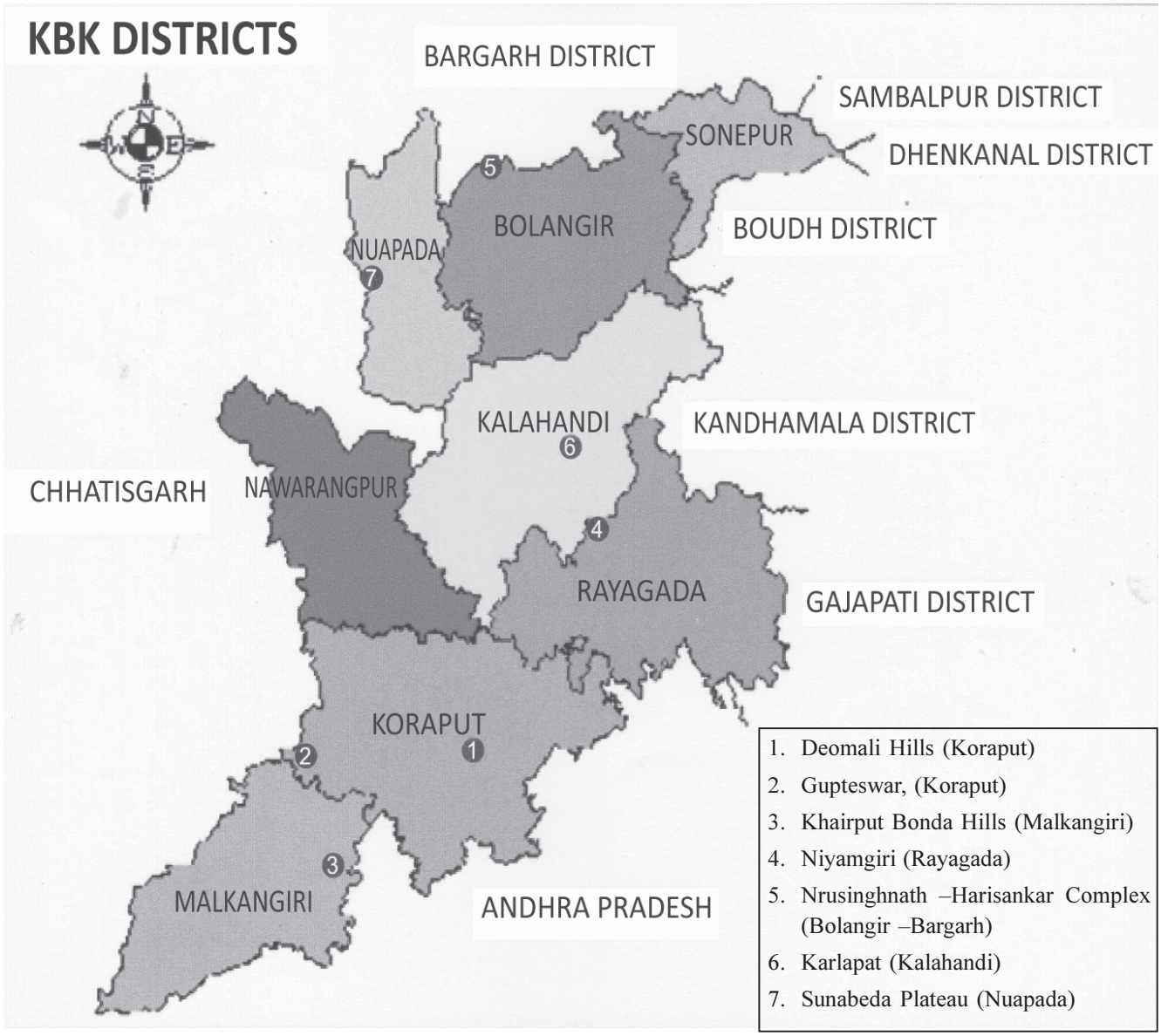

Fig-1: Map of KBK districts showing proposed Micro Hotspots of Medicinal Plants.

ii) *Barleria prionitis* L.

An armed under shrub with thorns belonging to family Acanthaceae, found in open places at outskirts of Gupteswar area. Locally known as 'Kanta jati' or 'Das-karenta', the leaf of the plant is used as paste in curing cracking of the feet and in case of rheumatism.

iii) *Adenostemma lavenia* (L.) Kuntze.

Belonging to family Asteraceae, it is a herb, often attaining 70 cm height, corymbosely branched above. Found occasionally in valley forests of Gupteswar area of Koraput district. Locally known as "Butame" by local Bonda tribals. Leaf ash is used for curing burn wounds.

iv) *Embelia tsjeriam-cottam* (Roem & Schult.) DC.

Locally known as "Baibedanga" it belongs to Myrsinaceae family. It is a small tree upto maximum 6mt height found rarely in Gupteswar area. Root bark is used to cure fever and fruit is used as blood purifier.

v) *Phyla nodiflora* (L.) Greene.

A prostrate herb, strigose with short hairs; belongs to Verbenaceae family. Locally known as "Gosing". The whole plant is used to cure fever. Given as a first drink to women after delivery.

3.3 Khairput- Bonda hills

The Bonda hills, mostly inhabited by Bonda tribes (Remo) is now in national and international news not because of the fact that they are the most primitive and aggressive tribe of eastern India, but because of their farm settlement in the hill range of Khairput block of Malkangiri district, comprising of 32 villages (Mohapatra and Mohanty, 2008). All these 32 villages are located on different hill slopes at a height of 3000 to 4000 ft. Bonda tribes are mostly dependant on naturally grown medicinal and food plants. Since, this part of Eastern ghat has not yet been properly studied except two important publications (Aminuddin and Girach, 1991 and Prusti, 2007), the pervading deep forest with diversified species is proposed for declaring as a micro hotspot. Further investigation can reveal the occurrence of many unnoticed medicinal plants from this region. During our study, some important medicinal plants collected from this area are;

i) *Phyllanthus fraternus* Webster

Erect annual herb belonging to family Euphorbiaceae, locally known as "Bhumalati" in Kondh community and as "Bhui Amla" in Odia. A common weed in Khairput Bonda hills, the root is used for curing jaundice and ulcers. The whole plant is used for treatment of Gonorrhoea and Menorrhagia etc.

ii) *Argemone mexicana* L.

A glabrous herb, belongs to thr family Papaveraceae, locally known as "Kantakusum". It is a fairly common weed in Khairput area. Fresh root is grounded with black pepper and the extract given orally one spoonful twice a day for 5 days till fever cures.

iii) *Cissampelos pareira* L.

Commonly called as 'Purnogab' by Bonda people. It is a slender climber with perennial root stock belonging to the family Menispermaceae, commonly found in Bonda hills. Stem is used to stop headache. Root powder is used with 'salap' in liquor preparation.

iv) *Elephantopus scaber* L.

The species belong to the family Asteraceae. It is commonly known as 'Duisunika' amongst Bondas and in Odia known as 'Chhota-rasna' or 'Mayurchulia'. An erect rigid herb commonly found in Bonda hills. Root powder is used for treatment of Pyorrhea. The whole plant is used to regularize menstrual irregularities.

3.4 Niyamgiri hills

Standing at more than 2000 ft above the sea level, the picturesque Niyamgiri hill range has drawn the attention of the whole country, in view of its mineral wealth and intervention by Vedanta Groups of Companies. The hill ranges spread from Chhatikona in Bissamcuttack block of Rayagada district upto Lanjigarh of Kalahandi district. This hill range of Eastern Ghats, running upto Gandhamardan hill range is inhabited by ethnic people such as Dangria Kondh. Endowed with wide range of biodiversity, the Niyamgiri hill range is equally important as a store house of medicinal plants like that of minerals. On the backdrop of a controversy of mining at the cost of biodiversity in this hill range, there is an imminent need to protect this area as a micro hotspot of medicinal plants for future generation of local ethnic groups to be utilized for their primary health care system. A few valuable medicinal plant species found here are;

i) *Ludwigia perennis* L.

Belonging to family Onagraceae, this is an usually erect annual herb. Found in wet places of Lanjigarh in Kalahandi district. The Odia name is 'Latkera'. The leaf of the plant is used for treatment of chronic dysentery.

ii) *Aeschynomene ameicana* L.

An erect herb with hirsute branches belonging to family Fabaceae is found occasionally along river sides between Bhawanipatna to Lanjigarh. Dried root powder with pepper is given in case of gastric pain.

iii) Fioria vitifolia *(L.) Matt.*

The species belongs to the family Fabaceae. A herb or under shrub is frequently found in waste ground and forest edges of Lanjigarh. The leaf paste is used to heal up summer boils.

iv) *Saraca asoca* (Roxb.) de Wilde.

A Critically endangered species, found in Niyamgiri hills. A small tree belonging to family Caesalpiniaceae and known as Ashok in Odia has become very rare in the state. The stem bark is used in Leucorrhoea and Menorrhagia.

3.5 Harisankar - Nrusinghnath complex

The Harisankar - Nrusinghnath complex represents an unique eco-system and a place of uncommon natural beauty harbouring rich floral diversity and vast natural wealth (Mishra & Das, 1998, Patnaik & Rath, 2014b). This complex embraces the Gandhamardan hill ranges of Ramayan epic fame. On the southern slopes of the Gandhamardan hills

which stands between Bolangir and Baragarh district of erstwhile Sambalpur district border, is having famous shrine of piligrimage Harisankar. On the northern flares of the hill side inside Baragarh district is located another famous temple Nrusinghnath. Both Harisankar and Nrusinghnath are linked by a difficult path across densely wooded mountain tract. The diverse vegetation resources, hilly topography with lofty laterite plateau and excellent drainage systems on both sides have made the region wealthy from biodiversity point of view including rich medicinal plant resources. However, the forest habitat of the area is under threat from anthropogenic pressure such as over exploitation, shifting cultivation, grazing and forest fire. It is proposed to conserve this area as a micro hotspot of medicinal plants, linking conservation practices with deep rooted religious beliefs of local people. The rare medicinal plants found in the locality are;

i) *Symphorema polyandrum* Wight.

A large scandent or subscandent shrub, belonging to Verbanaceae family. Once found frequently in Gandhamardan hill range has now become vulnerable. Local name is 'Badichang'. Seed powder is used as an antidote in case of snake bite.

ii) *Uraria rufescens* (DC.) Schindl.

Locally known as Salparni, this is an under shrub which belongs to the family Fabaceae. Once found frequently in Harisankar locality has now become rare. Whole plant decoction is given in case of bile trouble and acidity.

iii) *Eulophia nuda* Lindl.

The species belongs to the family Orchidaceae. Locally known as Bharat batuli or Churia kand. Once found frequently in Batipathar area of Gandhamardan hill range, has now found only occasionally. Tuber paste is used for treatment of Spermatorrhoea.

iv) *Erythrina resupinata* Roxb.

An under shrub belonging to Fabaceae family having Odia name Barakanda Rare among grasses on plateau of Gandhamardan. Root powder is prescribed for rheumatism. Grounded root with pippali, black pepper, cloves, ginger, kalazira given to reduce fever.

v) *Mucuna nigricans* (Lour.) Steud.

Locally known as 'Badabaidanka', it is a large climber belonging to Fabaceae family. Available in damp places of Harisankar locality. Seed is used to cure ulcer of the organ of both sexes.

3.6 Karlapat

Encompassing, a dense Sal and Bambo forest and the magnificent 'Phulijharan' waterfall, on its outskirts, Karlapat, situated about 12 km from the district town of Bhawanipatna in Kalahandi district, has been declared as a sanctuary since 1987. The undulating topography of the sanctuary covering a dense patch of lush green dry deciduous forest, occasional grass lands and having valleys, perennial streams make it rich both in floral and faunal diversity. During the course of study, a good number of rare and valuable medicinal plants could be noticed (Patnaik & Rath, 2014c). Because of the protection provided to this area, once after declaration of sanctuary, the floral diversity including medicinal trees, herbs, shrubs and climbers are well conserved. This area is proposed to be developed as a micro hotspot for the future researchers from medicinal plant points of view. Some valuable medicinal species found here are;

i) *Homalium nepalense* Benth.

This is a plant species of the family Flacourtiaceae, the Odia name being 'Dhanimari'. It is a small to medium sized tree found in rocky valleys. The bark of the tree is used in case of stomachache.

ii) *Breynia retusa* (Dennst). Alston.

Locally known as 'Raktatrichuli', this undershrub belong to Euphorbiaceae family. Available in open forest of Karlapat. The bark paste is applied on inflamation.

iii) *Byttneria herbacea* Roxb.

It belongs to the family Sterculiaceae. Locally known as 'Samarkhai', this is a perennial herb found occasionally in the forest undergrowth of Karlapat sanctuary. Roots are thoroughly washed and made into paste and applied on the injured parts of the body to give relief from pain and swelling due to injuries.

iv) *Macaranga peltata* (Roxb.) Muell. – Arg.

Locally known as Gandhaguria and belongs to family Euphorbiaceae. A small or moderate sized tree rarely found in valleys. Root bark paste is used to cure bone fracture.

v) *Cordia macleodii* (Griff.) Hook. f.

It belongs to the family Ehretiaceae, locally known as Sambarsingha. Leaf and root bark is used for healing of cut wounds. A small tree found occasionally in the sanctuary area.

3.7 Sunabeda Plateau

The Sunabeda Plateau located in the erstwhile district of Kalahandi and presently in Nuapada district is famous for its natural beauty endowed with dense forest. The forests are characterized with a series of long hill ranges with slopes from steep to precipitous, running approximately north to south. The major portion of the plateau covering an area of approximately 600 sq. kilometer was declared as a wild life sanctuary during 1988, which serves as a protected area network. Covered mostly with dry deciduous forests, enchanting hill ranges and scattered grass lands and sparsely populated mostly by primitive Bhunjia tribes, the plateau is dominated by nearly 400 plant species of which more than 50% of plants are used for health care of the ethnic people living within and around the sanctuary area (Aminuddin and Girach, 1993). Recently, the area has become almost inaccessible to outsiders due to growing leftwing extremism. But once, the normalcy is restored, the plateau will serve as a treasure house and micro hotspot of medicinal plants for future generation of workers (Patnaik & Rath, 2014a). Some rare medicinal plants found in the plateau are;

i) *Blepharispermum subsessile* DC.

A slender shrub, belonging to family Asteraceae and locally known as 'Rasnajadi' is found in 'Gorudangar' Medicinal Plant Conservation Area (MPCA) near Sunabeda plateau and has now come under endangered category. The root of the plant is used to cure rheumatism.

ii) *Polycarpaea corymbosa* (L.) Lam.

An erect, branched herb of Caryophyllaceae family is found occasionally in dry sandy places of Sunabeda plateau. The Odia name is Sanatjatia. Leaf paste is used on boils and inflammatory swelling.

iii) *Grewia sapida* Roxb.

Locally known as Bansuli and belonging to family Tiliaceae, it is an under shrub with woody root stock found in open forest of Sunabeda plateau. The root paste is applied locally on boils by Bhunjia tribe.

iv) *Wrightia tinctoria* (Roxb.) R. Br.

Locally known as 'Set Kure' or Pita karuan, this is a small tree with milky juice and belongs to family Apocynaceae. Found in dry mixed deciduous forests of Sunabeda plateau. Bark and root paste is given to expel thread worms.

4. Discussion

Hotspots are the areas featuring exceptional concentration of endemic species and experiencing exceptional loss of habitat. (Myers, 1988; Myers *et al.,* 2000). To qualify the list of hotspots, an area should have at least 0.5 percent of all plant species, worldwide be endemic. Some of the researchers also identify hotspots on the basis of richness of rare or taxonomically unusual species; in the areas under threat. Basing on the second criteria the above seven identified areas have been suggested to be declared as micro hotspot areas from medicinal plant point of view. Though recognition of hotspot is a pre-requisite to identify areas whose biodiversity needs urgent attention towards protection, so long as, no serious and planned conservation measures are implemented. Only mere recognition will not serve the purpose. There is an urgent need for systematic study of the above identified areas so as to collect information on the occurrence of different medicinal plant species in detail; their rarity and threat status, the condition of their habitat so as to chalk out a successful conservation plan and strategy for the future.

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