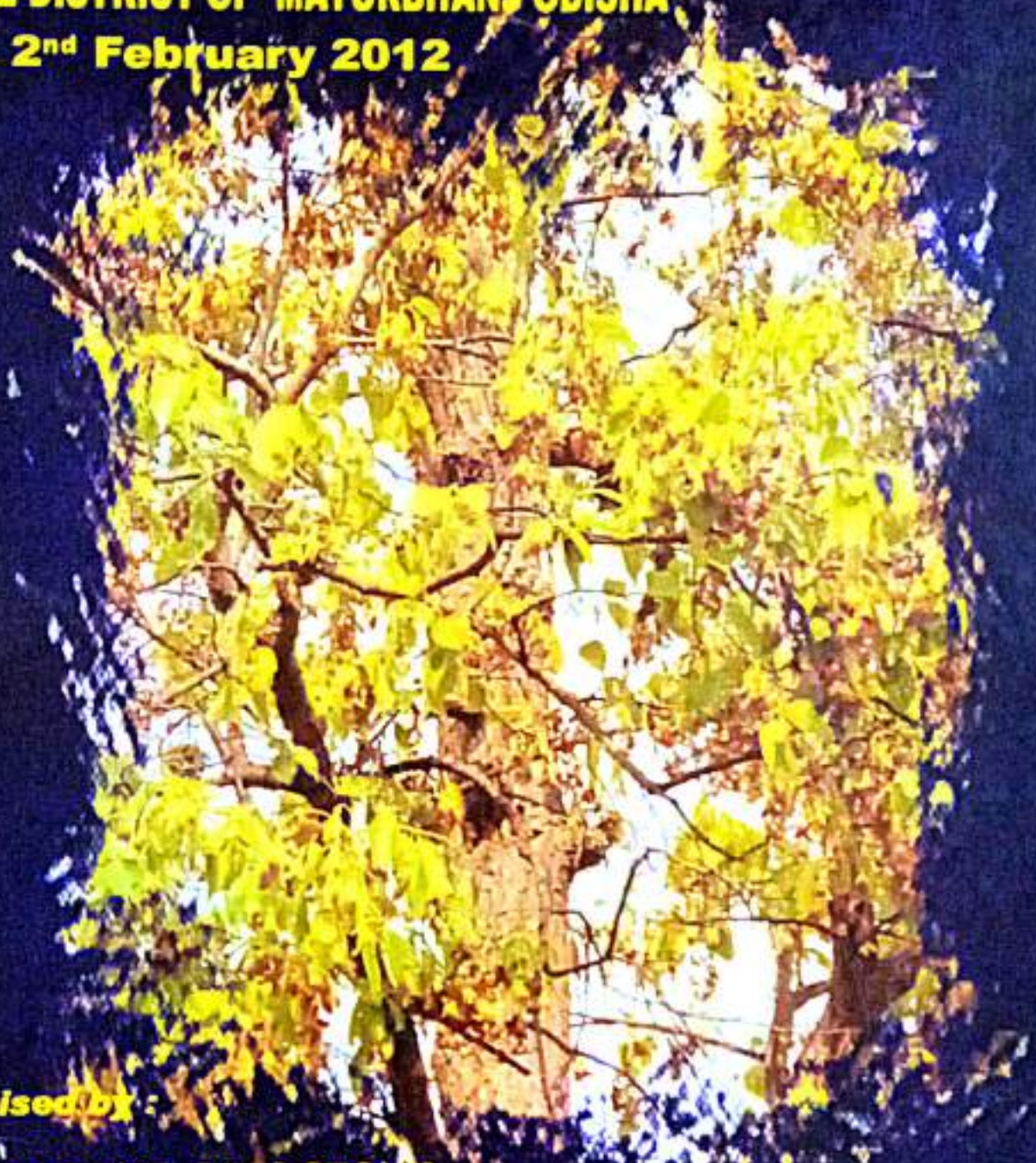
Proceedings of

UGC SPONSORED STATE LEVEL SEMINAR ON

THE NEED OF ETHNOBOTANICAL STUDIES OF SIMILIPAL, IN THE DISTRICT OF MAYURBHANJ ODISHA

1st & 2nd February 2012



Organised by :

DEPARTMENT OF BOTANY
B.B. COLLEGE, BAIGANBADIA, MAYURBHANJ, ODISHA

In Collaboration with

SEEMANTA MAHAVIDYALAYA, JHARPOKHARIA, MAYURBHANJA

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ON

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1st- 2nd, February, 2012

Organised by
DEPARTMENT OF BOTANY,
B.B.COLLEGE, BAIGANABADIA,
MAYURBHANJ,ODISHA

Affiliated to
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In collaboration with
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DECLARATION

The Department of Botany, B.B. College,Baiganbadia,Mayurbhanj, Odisha-757105 bears no responsibility regarding the statements, opinions and conclusion made by the authors.

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Ph.D.
Vice-Chancellor

MESSAGE

I am happy to know that Department of Botany, B.B. College, Baiganbadia in the district of Mayurbhanj in collaboration with Seemanta Mahavidyalaya, Jharpokharia is bringing out a seminar proceedings on the occasion of organizing a UGC sponsored State Level Seminar on "The need of Ethnobotanical Studies of Similipal, in the district of Mayurbhanj, Odisha" held on February 1 & 2, 2012.

I wish the publication a grand success.

(Sanghamitra Mohanty)

Majestic JORANDA WATERFALL inside Similipal

B.B. COLLEGE, BAIGANABADIA

Mayurbhanj, Odisha,757105

Mr. Pradeep Kumar Rout
Principal

MESSAGE

I am extremely glad that the Department of Botany, B.B. College, Baiganabadia, Mayurbhanj, Odisha, 757105 is going to publish the Proceedings of the State level Seminar held on 1-2, February, 2012, on "*The Need of Ethnobotanical Studies of Simlipal in the District of Mayurbhanj, Odisha*" in the form of a book which is a meaningful enterprise to discuss the latest trends and their applications in the frontier of knowledge. I hope, the research articles in the compilation will be helpful in future for research purposes in the field of Ethnobotany..

I wish all success of the Seminar and the Publication.

(P. K. Rout)
PRINCIPAL

Acknowledgement

The Department of Botany, B.B.College, Baiganbadia, Mayurbhanj is highly grateful to the Joint Secretary, UGC Eastern Regional Office, Kolkata for kind approval of the proposal and granting funds for organising the State level Seminar on *"The Need of Ethnobotanical Studies of Simlipal in the District of Mayurbhanj, Odisha"* on 1st and 2nd February, 2012.

We express our deep sense of gratitude to esteemed Principal, Mr. Pradeep Kumar Rout for his valuable guidance. We are also grateful to the Principal and Staff of Seemanta Mahavidyalaya, Jharpokharia for their collaboration in organising the Seminar.

We are thankful to our guests Dr. A.K. Biswal, Head, P.G. Departmant of Botany, North Orissa University; Dr. S.S. Mohanty, Reader in Botany, Rairangpur College, Rairangpur , Mayurbhanj; Dr. Biswajit Rath, P.G. Department of Bio-Technology, North Orissa University; Mr. Anil Kumar Kar, Principal, Seemanta Mahavidyalaya, Jharpokharia; Mr. B.P. Barik, HOD, P.G. Departmant of Bio-informatics, North Orissa University; Mrs Anjali Dash, HOD, Botany, Seemanta Mahavidyalaya, Jharpokharia; Mrs. Malati Barik, Reader in Botany, Seemanta Mahavidyalaya, Jharpokharia; and Mr. F.C. Behera, Lecturer in Botany, Seemanta Mahavidyalaya, Jharpokharia.

Lastly, we are thankful to the Staff, Colleagues, Students and well wishers in organising the Seminar and publishing the Proceedings most successfully.

Mr. Ashok Kumar Sharma
HOD, Botany,
Organising Secretary of the Seminar

Editorial.....

Man has been depending on plants since time immemorial. The recent discovery of certain remarkable properties of plants gave new life to an ancient science, Ethnobotany. Ethnobotany deals with the direct relationship of plants with man. Ethnobotany deals with the study of tribal rural people with a view to unearthing their deep and unique knowledge about the properties and uses of plants which may lead to the discovery of new herbal sources of food, drugs, etc.

Similipal Biosphere Reserve is a grand repository of valuable plant resources on which most of the tribal people of Mayurbhanj depend for their livelihood. So, it is the right time to make an intensive ethnobotanical study of Similipal Biosphere Reserve by the researchers and students to explore the valuable plant resources existing in this zone which will greatly help to the upliftment of tribal communities of this area.

Ashok Kumar Sharma

Organizing Secretary

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CONSERVATION OF ETHNOLOGICALLY IMPORTANT SEEDS BY NANOTECHNOLOGY

M. Pal

Nanotechnology is one of the emerging fields of science integrating life science, material science and information technology. Nanotechnology is the self-assembly of individual atoms, molecules or molecular clusters into structures to create materials and devices with different properties (Roco et. al; 1999). Application of nanotechnology in the seeds of agriculture and ethnological important plants has been more useful in improving the existing crop management techniques for cultivated and extinct plant species through use of nano-particles encapsulated herbicides, pesticides, fertilizers and hydrophobic nano silica for combating the pest attack.

Engineered nano-materials such as carbon nanotubes, quantum dots, nano gold, nano silver, nano aluminium oxide, titanium oxide, zinc oxide and nano sized polymers have received a particular attention for their positive impact in seed technology. Invention of scanning tunneling microscope (STM) and atomic force microscope (AFM) has made the nano world more accessible to us by manipulating or constructing them as per our needs.

1. Nano-bar-coding of seed

Nano-barcodes are free standing, cylindrically shaped metal nano-particles having dimension of 20-500 nm in diameter and 0.04 – 0.15 mm in length which are decodable and machine readable (Nicewarner – Pena et al., 2001). The particles are manufactured in a semi automated highly scalable process by electro-plating of materials like gold, silver into templates of definite dimension and then releasing the resulting stripped nano-rods from the templates

The barcodes are so small that they can be affixed on the seeds. To know the whereabouts of the seed, the seed can be agitated in a solution and can be read using a barcode reader. Information like location, date of harvest, germination, purity etc. present on the barcode can be downloaded easily and used. This will also help in Intellectual Property Right (IPR) protection of seeds.

2. Seed Protection:

Nano particles of gold (Au) was found to possess antibacterial and antifungal properties [Panacek et al, 2008; Jo et al., 2009; Kim et al., 2009; Singh et al., 2008]. Silver (Ag) nano-particles were found to possess broad spectrum of antimicroblal activity by controlling the spore producing fungal pathogens. Thus the use of silver nano-particles as a coat on seeds has potential in effectively controlling the seed borne diseases by preventing the sporulation and penetration of fungus and bacteria. Thus save the life of the seeds without any deterioration in seed quality and viability.

3. Seed hardening:

In India, more than 60% of the net area sown is under rain fed system. The seed hardening techniques have been standardized for a wide array of crops to ensure germination utilizing the available moisture in soil. Though it is a useful strategy but rarely adopted by the farmers due to practical difficulties. This was overcome by using carbon nanotubes.

i. Carbon nanotubes:

Carbon nanotubes (CNT) increase the germination and shorten the germination time of seeds by improving the water penetration into the seeds. With the starting moisture level content of 18.4 %, CNT treated seeds accumulated 57.6 % while the non treated one had only 38.9 % moisture. Thus this leaves a hope on its utilization in other crop seeds as well. Thus the seeds coated with CNT when sown in rain fed condition will germinate faster utilizing the available moisture in the soil. CNT also enhance root elongation in onion and cucumber but do not enter into the roots. Studies have supported the positive effects of suspensions of multiwall CNTs (MWCNTs) on seed germination and root growth of six different crops like radish, rape, rye grass, lettuce, corn and cucumber [Ling and Xing, 2007]. Response of CNTs varies with the type of plant species, their growth stages and the nature of nano-materials.

ii. Nano polymer coating:

Several polymers available in the market of which water soluble polymers are of immense use for coating the seeds. These water soluble polymers at the threshold of moisture in the soil (above 50 %) gets dissolved allowing the coated seed to absorb the moisture and germinate. This will ensure continued growth of the germinating seedlings for the successful establishment under dry land conditions. Another type of polymer utilized for

enhancing / delaying the seed germination is temperature responsive. The permeability property of these polymers is induced by the temperature, e.g. the seeds treated with **'Intolimor'** were found to take less water at 10 ^{0} C compared to 25 ^{0} C. The thermo-sensitive polymer coating technology allows to plant when soils are cool but otherwise fit. Polymer-coated seed emerged uniformly and had ideal stand than the non-coated seeds (Johnson and Hicks, 1999). Landec Agro Company has launched three commercial polymer products namely – Early Plant Corn, Pollinator Plus and Relay Crop Soybean for temperate countries. For the tropical countries like India, these technologies are to be tailored to suit our climatic condition. Another polymer coating technology includes polymer banding technique wherein two or three polymers can be coated on the seeds. Polymers may be hydrophilic or hydrophobic, thermo-stable or thermo labile, nutri rich etc.

4. Seed physiology

- Basu (1994) in several agricultural crops observed that treatment of high vigour (freshly harvested) seeds with crude plant materials viz, Red chilly fruit powder, tamarind powder and Trigonella seed powder @ 2 g / kg significantly slowed down the deterioration of seed under various ageing conditions. Normally these crude powders are macro sized and enter through the cracks in the seed coat. The efficiency of penetration and action will be more if nano-sized powder is used.
- The vigour of seeds decreases with increase in storage time due to the accumulation of free radicals (Wilson and McDonald, 1986). It has been shown that nano- TiO_2 in proper concentration when treated with aged spinach seeds enhance germination.
- Nano- particles of TiO_2, zinc oxide, iron oxide, platinum, manganese are found to have anti- oxidant properties and slow down the aging process of seeds.
- Treatment of nano-particles of ZnO, TiO_2 (0.4 – 1.0 g/ kg of seeds) with black gram seeds maintains higher vigour and vitality of seeds than untreated check (Natarajan, 2011).

5. Nano-Biosensors

- **E- nose** (electronic nose) is a nano-biosensor composed of ZnO nano wires that mimics the operation of human nose in detecting different gases due to change in resistance in wires which is detected by change in electrical signal.
- Seeds during storage emit several volatile aldehydes that determine the degree of ageing. Such volatile aldehydes can be detected and seeds showing signs of

deterioration can be separated prior to their use. Hence this technique can be employed in storage decision making.

- During seed production, isolation distance is maintained to avoid contamination of foreign pollen. Usually pollen flight is determined by its weight, air temperature, humidity and wind velocity. Provision of '**micro electronics sensors**' specific to the pollen of seed crop, placed along the perimeter of the seed field at varied height detect the possible contamination. This technique has the advantages like fixing up the isolation distance for the seed crop and to prevent pollen of GM crop from contaminating natural crop.

6. Seed Dormancy:

Several seeds exhibit dormancy due to the presence of inhibitors like ABA, dormin, phenols etc. To overcome this type of dormancy seeds are being soaked in growth promoter before sowing. In contrast, if nano-particles of growth regulators are used, required quantity of seeds can be treated with very low doses on the surface of the seeds. The nano-particles will enter into the seed during imbibition and break the dormancy and ensure continuous growth. e.g. mixture of nano- TiO_2 and nano-SiO_2 could increase the nitrate reductase in soybean which enhance its ability to absorb and utilize water and fertilizer, stimulate its anti-oxidant system and apparently hasten its germination and growth. Treating the seeds with ZnO nano-particles, the level of growth regulators inside the seeds can be altered to enhance its germination.

7. Detection of Seed moisture:

Seed moisture has a definite role in seed storage and longevity. High moisture seeds are poor storers. Seeds can be coated with highly purified lithium chloride quantum dots by spraying so as to serve as indicator for monitoring moisture content during storage. Lithium chloride is blue when dry and upon hydration turns pink. This technique is of very useful in germplasm conservation.

8. Analysis Seed image:

- Seeds have many variations in its surface (seed coat) among different genotypes of a particular species and among the different genera. Seed coat is a specific feature for each crop variety. Nanotechnology has the option to study these variations in structures and systems through scanning electron microscopic diffraction and spectroscopic methods.

Examination of seed coat under scanning electron microscope (SEM) help in understanding its structure for the following purpose:

1. Temporal changes in seed coat structure and its pattern during seed development and maturation will aid in devising suitable method to protect the seeds.
2. Understanding the mode of action of scarification treatment on seed coat.
3. Conformation of variety / species, inter-specific and inter-generic hybrids based on seed coat pattern.

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ETHNOBIOLOGY AND COMPUTATIONAL APPROACH FOR BIODIVERSITY CONSERVATION

Bibhuti Prasad Barik [1]

Kumananda Tayung[2]

Background

Ethnobiology is a fast growing field of research, gaining professional, student, and public interest globally. There is a pressing need in ethnobiology to define and focus research objectives; to explore modern methodology appropriate for studying people-biota-environment interactions; to quantitatively analyze multidisciplinary data based on hypotheses. Biological taxonomy provides the central link between diverse items of information about an organism. Given the scientific name of an organism, a researcher can query a wide range of databases for information on that organism's genome, development, morphology, geographic distribution, behavior, phylogeny, and conservation status. However, the utility of taxonomic names as keys to accessing information is hampered by several factors, notably the lack of a single authoritative list of all taxonomic names. In the absence of such a list, databases that make use of taxonomic names have no ready means of validating those names. Consequently, there is no guarantee that taxonomic names stored in different databases will be mutually consistent.

Ethnobiological research has historically played a vital role in humankinds understanding of the relationship between people and the biological environment. Ethnobiologists have however been very slow to adopt and apply tools of the informatics revolution and to integrate research data collaboratively. If ethnobiology is to continue to develop as a discipline, what is needed in the near future is not only a continued effort to promote collaborative ethnobiological research but also to devel-op an initiative to bridge the digital gap between ethno-biologists and emerging bioinformatics tools. Through an improved understanding of the application of information technologies and the traditional ethnobiological research model, tomorrow's scientists may better record and com-pare traditional knowledge. This inte-gration would greatly assist in stemming the tide of the unprecedented loss of global bio-cultural diversity.

Managing and applying primary biodiversity data

Methodology in ethnobiology is becoming more experimental, more technological, and more participatory. Passive observation and informant query are reinforced with

experimental biology techniques borrowed from molecular, population, autecological, community, and ecosystem biology. Technology, from the molecular to the global level, is becoming progressively more important in ethnobiology. Simultaneously, indigenous people are becoming increasingly empowered within ethnobiology to define research, development, and conservation priorities and to participate in the research and education efforts associated with ethnobiology. Data from these methodologies must be subjected to statistical rigor. These methodological changes are profound and require explicit characterization to facilitate their creative utilization within ethnobiology. Analyses of ethnobiological data may be undertaken with current demographic models (of microbes, plants, animals and people), with nonlinear analyses to model combined interdisciplinary data, with bioinformatics to analyze the plethora of molecular data generated by relatively simple evolutionary models of plant or animal domestication and with many other models and methods.

Smaller-scale human, biota and environmental interactions often play out at higher levels of communities, landscapes and global trends. Ethnobiology traces these effects and examines their causes. Plant communities such as tropical rainforests—often assumed to be primary, pristine and even virgin are now recognized as being significantly influenced by human management. Landscape transformations are dependent on distributions of culture, biota and environments resulting in surprising patterns: biodiversity is correlated with human cultural diversity. The complex links between human cultures and biodiversity are of great concern to ethnobiology with broader impacts on both biodiversity conservation and cultural survival.

Bioinformatics and ethnobiological database

Bioinformatics has gained popularity during the last few years to describe tools and techniques for storing, handling, and communicating the massive and ever increasing amounts of scientific (primar-ily biological) data. Made possible by dramatic improve-ments in computational power and computer accessibility, bioinformatics has become a major scientific discipline. Traditional approaches to gather and disseminate ethnobiolgical information are clearly inadequate to deal with the global increase of ethnobiological research data. The print journal publication process is often very slow and the relevant information (including large data sets, maps, and photographs) is often too large or complex for traditional print media. Electronic storage and retrieval of-fers an effective solution for the storage of data especial-ly multimedia objects (digital images, sound, and video),

comparative analysis, and the rapid distribution of a po-tentially large amount of data (Schalk and Oosterbroek, 1996). Consequently, numerous electronic databases have recently been developed to disseminate informa-tion on plant uses. Most of these are available via the in-ternet through the World Wide Web. However, because these databases were designed and developed independently, they are often oriented toward particular user groups (e.g. students, researchers, or the general public). As a consequence, the information they contain is very variable in its content and quality, often only having a regional or cultural focus. Currently, the infrastructure for collaborative interdisci-plinary scientific research through the internet is growing, one rich with power and promise (Lucky, 2000). Howev-er, many web sites delivering ethnobiological information contain anecdotal data and questionable research meth-odology and often do not include the detailed references necessary for sound scientific research.

Georeferencing Biodiversity Data

Over the past 250 years, biologists who were interested in describing and understanding patterns of biological diversity have gone into the field to observe and collect species. Conservation of the specimens and data collected through these explorations has produced an irreplaceable archive of life on Earth (Chapman and Busby, 1994). Today, the billions of specimens in natural history collections, such as dried plants and stuffed birds, play a fundamental role in generating new knowledge about biodiversity and in guiding its conservation. Yet, the potential of this vast store of data is much greater than is currently realized. There are three main challenges to the effective use of specimens in natural history collections and of related observation data, such as bird counts. The first challenge is to capture the information associated with specimens, such as species name and the day and locality of collection, in computer databases. The name of an organism and the location in which it occurs are information elements most widely used by consumers of biodiversity data—including researchers, educators, natural resource managers, and the general public. The second challenge is to make this information, housed in many hundreds of separate institutes, easily accessible via the Internet. Through a large number of digitization and computer application development efforts, these challenges have been partially overcome, as is illustrated by the nearly 100 million species-occurrence records that are currently available through the Global Biodiversity Information Facility (GBIF; http://www.gbif.net). Many of these records have never before been electronically accessible, let alone from a single point of access that uses sophisticated

protocols to directly retrieve information from primary data custodians. The third grand challenge, and the focus of this article, is to further increase the value of these species-occurrence records by converting the textual descriptions of places where data and specimens were collected into their corresponding geographic coordinates—to georeference them. The number of species-occurrence records worldwide that are not currently georeferenced is astounding; more than 99% of the one billion or more biological specimen records (Duckworth et al. 1993) lack geographic coordinates. This severely limits the degree to which past and current distributions of species can be mapped and analyzed in combination with spatial data from other disciplines (e.g., climatology, geology, geography, social sciences) (Graham et al. 2004).

Phylogenetic diversity and biodiversity conservation: bioinformatics challenges

Biodiversity conservation addresses information challenges through estimations encapsulated in measures of diversity. A quantitative measure of phylogenetic diversity, "PD", has been defined as the minimum total length of all the phylogenetic branches required to span a given set of taxa on the phylogenetic tree (Faith 1992). While recent papers incorrectly characterizes PD as not including information about deeper phylogenetic branches, PD applications over the past decade document the proper incorporation of shared deep branches when assessing the total PD of a set of taxa. Phylogenetic lineages, often corresponding to new, "cryptic", taxa, are restricted to a small number of stream localities. A recent case of human impact causing loss of taxa in one locality implies a higher PD value for another locality, because it now uniquely represents a deeper branch. This molecular-based phylogenetic pattern supports the use of DNA barcoding programs for biodiversity conservation planning. Here, PD assessments side-step the contentious use of barcoding-based "species" designations. Bio-informatics challenges include combining different phylogenetic evidence, optimization problems for conservation planning, and effective integration of phylogenetic information with environmental and socio-economic data.

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COLLECTION PRACTICES OF TRADITIONAL HEALER: A MEAN TO CONSERVE AS WELL AS TO SUSTAIN THE MEDICINAL PLANTS

Dr. Annapurna Dhal

The Herbal medicine has been widely practiced throughout the world since time immemorial. The use of the medicinal plants is well known to the people of Indian subcontinent since ancient time. Worldwide, the number of species used for medicinal purposed is estimated at more than 50,000, which is about 13% of all flowering plants (Schippmann et al. 2002). India being one of the world's 12 mega biodiversity, over 8,000 plant species is used in traditional and modern medicine (planning commission 2000). India enjoys export of herbal raw materials worth U.S. $100-114 million per year approximately. There is an increasing demand of the medicinal plants because of its growing use in pharmaceutical, cosmetic and food industries. It has been estimate that more than 90% of the medicinal plant is being collected from wild, as most of these are available in the forest. Collection from the wild may be unavoidable for many medicine plants that grow slowly and difficult to domesticate .Wild harvesting of medicine plants provides cash income for the forest dwelling community of Odisha.

The degradation of the medicinal plants occurs because of various reasons.

1. Higher Marked demand of the herbs and herbal products.
2. Unlimited destructive Harvesting
3. Harvesting without the knowledge on yield prediction
4. Lack of knowledge on species-specific ecological requirements.
5. Collectors and contractors of the medicinal plants primary interested in higher incomes in the short run and have little concern for sustainability.
6. Many collectors do not have the traditional knowledge for sustainable collection and have no ownership over the resources they exploit. They use collection methods that are often detrimental to the long-term availability of resources (Belt al.2003; Alam and Belt 2004).

It has been regulated by certain forest law but this regulation will affect the livelihood of the rural forest community. So there is need to standardize the method of collection so that it can be sustainable and address to conversation, as well as maintaining sources of

income for local people. Sustainable harvesting of the medicinal plant can be an important factor to ensure the linkage between the traditional culture, medicinal plant and conversation.

Environmental Impact Assessment of Wild Collection

The harvesting of the whole plants, Roots Rhizome, Heart woods, stem, Wood and Bark leads to mortality of the species by reducing the physiological process of the plants like transportation of the food, water and mineral resulted in reduction growth and regeneration. Excessive harvesting of exudates, resin, gum, latex, leaves, shoots and fruits causes' restricted growth of the plant resulted in reduction in the plant population. Harvesting of the reproductive parts like buds, stigma, flower, seeds etc. hampers the reproduction cycle of the plants species through hampering pollination, fertilization, seed formation and sometimes seed dispersal and regeneration of the new plant. This results in reduction of the population size of the particular plant community. It is evident that the collection of all the plant part causes stress to the plant species but the sustainable harvesting of the medicinal plants will able to reduce the pressure on the wild and also a sustainable livelihood to the forest dwellers.

Method of Collection of Plants Practiced by Traditional Healers

The traditional healers play a key role in sustainable harvesting, conservation and management of medicinal plant resources. The resources have been actively managed and utilized by indigenous healers. The healers use their own consumption and preparation of medicine and not for commercial purpose. So they do not collect the materials in very large quality at a time. Medicinal plants are collected from the remote dense forest area. The plants that are rare are being grown in the garden of the practitioners.

The practitioners do not posses scientific knowledge regarding sustainability of the plants but they are well acquainted with the seasonal relations associated with them, which helps in maintaining the therapeutic quality as well as availability of the plants. These practitioners also play a key role in various in-situ and ex- situ conservation methods. They plant medicine plants in the forest blanks and also collect them for conserving in their home herbal gardens. These associations of the practitioners along with the community in each area protect forest for conservation and sustainable management of medicinal plants.

The Practitioners strictly follow certain spiritual norms while collecting medicinal plants. These norms act as controlled mechanism for sustainable availability of plants.

The practitioners do not collect plants each and every day. The plants are collected during certain astronomical days like solar eclipse, Lunar Eclipse, Full Moon, Amavasya, sankranti, Saturday & Sunday. According to their belief the plant possess high medicinal quality during these events. Early morning is the best suitable time for collection. There are also norms regarding which plant should be collected during which particular event. These traditional beliefs and practices allow the plant sufficient time for its growth and bring back to its normal status. e.g. After collection of bark from an Arjuna(*Terminalia arjuna*) plant 6-9 months is required for regeneration of the tissues.

The practitioners also follow certain restrictions regarding selection the place for collection of plants. They always prefer to collect plants grown in the dense forest region where human intervention is less or nil. These restrictions indirectly lead towards conservation of some species. The plants are not collected from following places.

- Grave yard/cremation field
- Temple/Sacred places
- White anthill
- Roadside, just near a well, dry places
- Unhygienic places

When a root of any plants is required they do not directly uproot the plant but leave some portions of the root for its regeneration. When bark is required they cut it from one portion. They follow certain methods during harvesting of different parts of the plants in order to protect them from being destroyed and also save the plant for future purpose. These are:

- Roots: From one side & in north & East direction.
- Bark : In upward direction
- Seeds : Matured form

The practitioners also follow certain seasonal norms while collecting parts of different plants. As for e.g. Fruits are collected in the month of April, May, June, Bark is collected in autumn and roots are collected in winter.

Sl.	Name of the Plant	Local Name	Parts collected	Month of Collection
1	*Saraca asoca*	Ashok	Stem-Bark	Sept.-Oct.
2	*Terminalia arjuna*	Arjuna	Stem-Bark	Sept.-Oct.
3	*Emblica officinalis*	Amla	Fruit	Dec.-Feb.
4	*Embelia ribes*	Bidanga	Fruit	Sep.-Oct.
5	*Rouvlfia serpentina*	Patala garuda	Root	Sept.-Oct.
6	*Asparagus racemosus*	Satavari	Tuber	Sept.-Oct.
7	*Celastrus paniculata*	Pengu	Seed	Oct.-Jan.
8	*Strychnos nux-vomica*	Kochila	Seed	Dec.-Feb.
9	*Tylophora indica*	Ananta mula	Whole plant	Jan.-Feb.
10	*Andrographis paniculata*	Bhuin nimba	Whole plant	Jan.-Feb.

1. Harvesting of Stem – Barks

Barks are collected mostly from *Saraca asoca*(Ashok) & *Terminalia arjuna* (Arjuna) plants from one side of the stem in upward direction. This method helps in keeping intact xylem and phloem without causing harm to the transportation system. They usually collect the barks during September – October which is the autumn season. Since growth rate of the plant is maximum during this season the plant regenerate quickly.

2. Harvesting of fruits

The Practitioners collect fruits of *Emblica officinalis* (Amla) and *Embelia ribes* (Bidanga). These two have been degrading rapidly. The Amla fruit matures during the late month of December to February. Practitioners start collection of the fruit from late December and continue up to end of February. According to them a full-matured fruit has rich medicinal value and viable seeds are collected from matured fruit. The fruits are generally collected by shaking the trees, after they fall on the ground. This also helps in regeneration of the plants. Similarly fruits of *Embelia ribes* during September-November. Practitioners start collection from September and continue till November. They do not collect all the fruit but leave some for regeneration of the plant.

3. Harvesting of Roots & tubers

Roots of *Rouvlfia serpentina* and tubers of *Asparagus* are collected by the practitioners during early winter. During Collection of root of *Rouvlfia* the practitioners do not uproot the whole plant; they leave some portion of the root for regeneration. As this is growing season it can rejuvenate. During early winter the aerial part of the *Asparagus* becomes dry and the underground parts remain in the soil. Its tuber widely spread in the soil. So during its collection some portions remain inside which regenerates.

4. Harvesting of seeds

The Practitioners collect the seeds of *Celastrus* and *Strychnos nux-vomica* when the fruit get matured and fall down the tree. During the collection, seeds which are left on the ground, germinate without causing any harm to the availability of the plant.

5. Harvesting o whole plant

The Whole plant of *Andrographis paniculata* & *Tylophora indica* are collected during the month of January and February. During this season the plant matured with its flower and fruits. Some of the matured fruit burst with explosion of seeds, which helps in the germination of the plant with the commencement of the suitable season.

Conclusion:

The medicinal plants collected from the wild for business as usual practice is more or less destructive and leads to destruction of the species in the wild. Sustainable harvesting is not only the process implemented for the collection of the medicine plants by the traditional healers and the NTFP collectors for income generation but also it is the methodology for conservation of the medicinal plants in the wild. It is the key towards conservation of the medicinal plants and providing sustainable livelihood for the forest dependent community. Documentation of traditional knowledge adopted for the collection of the medicinal plants from the wild merged with the experimental demonstration of the practices leads to evolution of adaptive management for the sustainable harvesting of the medicinal plants.

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ETHNOBOTANY

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Ethnobotany is the study of how people of a particular culture and region make use of indigenous plants. It is explored as to how plants are used for such things as food, shelter, medicine, clothing, hunting and religious ceremonies. Plants have re-emerged as significant sources of new pharmaceuticals. Industries are now interested in exploring parts of the world where plant medicines remains the predominant form of dealing with illness. With the increase interest in the study of how native people use plants therauptically, pharmacology has emerged as a new field of study. Again with the renewed interest in using ancient plants as medicinal agents in modern western medicine, the field of ethno medicine has emerged, where physicians receive some training in anthropology, botany, public health or relevant social science. These physicians must possess a genuine receptivity to the distinctly unique views of the healing systems practiced by indigenous people, as well as the ability to work as a team with ethno botanists and others.

Beginning in the 20th century, the field of ethno botany experienced a shift from the raw compilation of data to a greater methodological and conceptual reorientation. Today the field of ethnobotany requires a variety of skills like botanical training for the identification and presentation of plant specimens , anthropological training to understand the cultural concepts around the perception of plants, linguistic training, at least enough to transcribe local terms and understand native morphology ,syntax and semantics.

There are over a hundred chemical substances that have been derived from plants for use as drugs and medicines.Acetyldygoxen a cardio tonic has its source from *Digitalis lantana*, Aescin the anti-inflammatory drug has its source from *Aesculus hippocastanum* , Ajmalicine from *Rauvolfia sepentina*, used in the treatment of circulatory disorders. Bromelain an antiinflamatory ,proteolytic drug source is *Ananas comosus* (pine apple), Chymopapain- proteolytic and mucolytic has its source from *Carica papaya*(papaya), Hesperidin used in the treatment of capillary fragility source from citrus species like oranges and many more.

In a century that has seen the loss of vast areas of natural habitats to development with many more hectares under threats each day, more and more people have come to value and appreciate what is left of the natural world. Conversationalists are realizing the great potential for the protection of endangered species by allowing limited, controlled

access to sensitive habitats coupled with educational guidance. This is where ethnobotany comes in-people learning about what they are seeing. Local guides enjoy teaching people about the many uses of plants. Thus a knowledge that was in danger of becoming extinct may be preserved.

Although ethnobotany seems to be a loose composition of theory and methods, common methodologies and theory can be found. Theoretically direct contact with the vegetation of a region is encouraged and essential in order for researchers to fully comprehend the flora of a small geographical area on which they usually focus. From close contact with the plants, ethnobotanists are able to relate local and specialized plant taxonomies and study all the physical properties of the plant.

Primitive tribes , such as our Indians, depended immediately upon their floral environment first of all for food, not only for their vegetal food, which was a very considerable part of their fare, but also ultimately for such animal food as they had, for the animal life in any region depends, in both quantity and quality upon the plant life. Dependence upon the vegetation of their habitat a people would naturally be induced to become acquainted with all the plants which grew about them and which held so large a practical interest in their lives.

Ethnobotanical study not only prevents misapprehension of observed facts , but is positively necessary in many instances to the correct diagnosis and explanation of ethnological facts.

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ETHNOBOTANICAL USES OF SOME MEDICINAL PLANTS BY THE TRIBES OF MAYURBHANJ, ODISHA

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The world is a beautiful place to live in. The nature has much resource potential which is useful for both plant kingdom and animal kingdom. The only thing is to exploit these resources to put into use of living organisms. In India, the Himalayan range of forests have got so many natural resources especially the medicinal plants which are used for Ayurveda medicines. These resources are to be tapped to put into use of humah, plants and animal kingdom.

Plants are an integral part of the nature and the nature reflect the creative power of living God. As a result of which God and nature are designed with specific purpose to enhance the physical beauty of thenature, the chemistry of which are of immense importance to humanbeings. Hence they are the life-sustaining force of Earth. **Jethrokloss**, a naturopath says that there is a wonderful signs in nature, in trees, herbs, roots and flowers to which man has never fathomed. If true remedies are found in nature the poisonous drugs and chemicals would be eliminated and sickness would be rare. Human kinds, in recent decades has alienated itself from nature, as a result of which the distance and differences between the man and nature has cause problems.

In continuation to this concept, it is observed that medicinal plants, over the years, continue to be an important Therapeutic Aid for alleviating ailments of mankind. The early man tried to explore his immediate natural surrounding in order to sustain its eternal health and longevity and to seek remedy to relief pain and discomfort. Hence he tried with the plants, animal

Legends say when Laxman was injured by the arrow of Ravan's son Indrajeet, the Baidya wanted the life saving "Sanjeevani" herb to be brought from the Gandhamardan hills for his treatment. Hanumana went in search of the wonder herb but failed to identify it. So he carried the whole mountain to Lanka. On the way a part of mountain fell down in Paikamal area and is now known as the Gandhamardan range of hills. It is a vast repository of medicinal plants. The hill Gandhamardan has already been recognised as a valuable source of important life saving medicinal plants as depicted in the Ramayans.

Odisha is the state which has the oldest and richest tradition culturally associated with use of medicinal and aromatic plants. This tribal dominated state is still prone to several remarkable medicinal practises for birth-control, wound healing and cure of chronic ailments. Apart from these there are million of women and elders those who have traditional knowledge of herbal remedies. During the present work the district of Mayurbhanj which has a vast resources of plants of medicinal values centering around the Similipal Bio-sphere Reserve.

Since the beginning of human history, man is using the plants of his surrounding for food, medicine, shelter, oil seeds, fibre, drink, narcotics etc. Some remnants of old civilisation are still remaining in the tribal people of the country. In the present day these people are living in remote areas, some still keeping themselves aloof from modern civilisation.

Now-a-days people prefer plant based medicines for their primary health care needs because of no side effects. But it is a matter of regret that major requirement of raw material of Indian herbal industry is being met by the collection from wilder sources and seventy percent of the collections involve destructive harvesting practices as their economic parts being roots, bark, leaf, wood, stem or the whole plant.

India is one of the richest sources of medicinal aromatic plants in World. Its botanical wealth comprises of nearly 45,000 species including 17,500 flowering plants. On account of the fact that derivatives of medicinal and aromatic plants are non-narcotic having no side effects, the demand of these plants is on the increase in both developed and developing countries. Sarpagandha (*Rauvolfia serpentina*) for reducing blood pressure, Mehendi (*Lawsonia alba*) for curing Jaundice, Ashwagandha (*Withania somnifera*) widely used as a substitute for ginseng as a rejuvenating tonic etc. *Terminalia bellirica, Andrographis paniculata, Cissampelos pareira, Phyllanthus fraternus, Chlorophytum arundinaceum* and *Argyreia nervosa* are also found to be used by the tribals but their number in this area is negligible.

A number of interesting tribal uses for antifertility, medicine, fibre, food etc. are described which might be of medicinal, industrial or nutritional values. On comparison with the important published literature on the medicinal and economic plants of the district many of these uses have been found to be new.

It is unfortunate that destruction of forest is going ruthlessly and many of the medicinal plants are on the verge of extinction now. In order to save these plants from further depletion conservation has become a necessity today. Since these plants are medicinally important for various diseases of heart, gynic trouble, gout, rheumatism, diarrhoea, dysentery, leprosy, bone fracture, skin disease etc., their preservation and propagation should be done and for that a medicinal garden should be maintained in the district. According to the estimation of the World Health Organisation (WHO), 80% of the population of developing countries rely on traditional medicines, mostly plant drugs for their primary health care needs. Moreover, the modern medicines contain about 25% drugs derived from plants .

So, knowledge on the economic parts and utilisation of important medicinal plants is vital and it is most relevant not only to conserve the depleting flora of medicinal plants but also to extend the area of cultivation with proper recommended package and practices. So now it is very relevant that the valuable plant species should not only be preserved but also their cultivation should be extended in order to meet the increasing domestic and export demand. Simultaneously awareness on the utilisation of major economic part of medicinal plant should be spread widely among the people.

Besides the plants discussed above there are many other plants which have numerous medicinal and pharmaceutical values and which are also the source of various important drugs. e.g. Root of *Boswellia serrata* Roxb. shows anti-cancerous activity. Aromatic oil produced from *Hyptis suaveolens* (Gangatulasi) is a good mosquito repellant.

All these plants occurring within the district may need to be phytochemically investigated as the various drugs extracted from them have been proved to be beneficial to the community. Considering the high prices of drugs and medicines in the country and our greater dependence on other countries for more of it, Scientists and Medicos, besides manufacturing synthetic drugs, should also look to the natural drugs obtained from plants. Similipal has vast resources of potential drugs of great therapeutic value. Search for these natural drugs should be extensively worked out to meet the need of the people.

The plant materials collected in the field together with notes on their uses by the tribals of the district are recorded. The information for each species deals with botanical name & family, its local name, parts used and remedies ..

The present paper deals with the uses of forty medicinal plant species collected from different tribal dominated areas of Mayurbhanj district. The species collected belong to twenty four families, out of which twelve families comprise of only a single species each, nine families have only two species each, two families possess three species each and a single family Liliaceae possess four species which is dominant family in the present study .The uses of some plants are mentioned below.

1. *Cissampelos pareira* Linn.

Local Name : Okanbindi

Oriya Name : Okanbindi

Family : Menispermaceae

Place of Collection : Pithabata

Slender climber with perennial root-stock, leaves broadly ovate or orbicular, apex obtuse, margin entire, lower surface pubescent, petiole 2-9 cm. long. Male flowers green to yellow, 2-4 cm. long, Female inflorescence upto 18 cm. Drupe orange or red. Flowering between June to Nov. and fruiting between Nov. to Jan.

Parts used - Root

Uses : Root used in urinary troubles like cystitis, dyspepsia, diarrhoea, dropsy and cough.

2. *Citrus limon* (L.) Burm. f.

Local Name : Lembu

Oriya Name : Lembu

Family : Rutaceae

Place of Collection : Baripada

Straggling bush and small tree, 3-4 meter with thorny branches, winged petiole, fruit oblong and ovoid, bright yellow ; pericarp thick, pulp acid, pale yellow.

Parts used : Fruit

Uses : Lemon juice is very useful for scurvy. Fruit in the form of pickle useful in hypertrophy of spleen. Peels candied, preserve rind used in dysentery.

3. Acacia catechu (L.f.) wild.

Local Name : Khaira

Oriya Name : Khairo

Family : Mimosaceae

Place of Collection : Udala

Small trees, bark dark brown, branches slender, branchlets generally glabrous. Leaf rachis, 5-15 cm. rarely 20 cm, leaflets 6-35 but mostly 12 - 20 pairs and sessile. Flowers white and yellowish, petals densely hairy, flowering in between July to September and fruiting on December.

Parts used - Bark, Heartwood, kath and leaves.

Uses : Leaves of older trees is used medicinally for sore throat and cough. Bark used to cure melancholia, conjunctivitis hemoptysis. Heartwood used to cure leucoderma, helminthiasis, foul ulcer and wound. Kath is used in the cure of laryngopathy and odontopathy.

4. Kalanchoe pinnata (Lam.) Pers.

Local Name : Amarpoi

Oriya Name : Amarpoi

Family : Crassulaceae

Place of Collection : Baripada

Glabrous, succulent herb, 30-90 cm., leaves opposite, simple, leaves or leaflets oblong or elliptic, 5-15 cm. long. Flowers pale greenish and purple in lax panicled cymes. Flowering in January to February and fruiting in March.

Parts used : Leaf

Uses : Leaf juice given for diarrhoea, dysentery. Plant paste is applied to forehead to relief headache.

5. Xantolis tomentosa (Roxb.) Rafin

Local Name : Jastimadhu

Oriya Name : Yastimadhu

Family : Sapotaceae

Place of Collection : Kabatghai

Small or medium size tree, usually thorny, bark grey or light brown, branchlets tomentose or densely brown hairy, leaves obovate, elliptic. Flowers white, small, solitary. Corolla 7.5 - 8.7 mm. long, berry yellowish. Evergreen plant. Flowering seen in between April to June and fruiting in between November to February.

Parts used - Fruits, Stem and Root.

Uses : Fruit pulp given to patients of cholera. Fruits contain a thermostable, antichloreic principle which completely inhibits the growth of vibriocomma. Stem bark decoction is used as remedy against cough and cold. The root bark is pounded with raw rice, made into cakes and given for rheumatism. The stem bark is pounded and its paste applied to the neck to relief pain due to cold.

6. Rauvolfia tetraphylla L.

Local Name : Sarpagandha

Oriya Name : Patalagoruda

Family : Apocyanaceae

Place of Collection : Gurguria

Spreading dichotomously branched shrub, branches pubescent, leaves 3 - 4 nately whorled, usually 2 unequal pairs in a whorl, elliptic, flowers white, small, 3 -7 in nos., drupes globose, red, flowering and fruiting found through out the year.

Parts used : Leaf and Fruit.

Uses : Extract of the herb mixed with castor oil is applied to skin ailments. Fruit yield as black dye.

7. Hygrophilla schulli (Ham.) Alm. & Alm.

Local Name : Koelekha

Oriya Name : Koelekha

Family : Acanthaceae

Place of Collection : Baripada

Herb or undershrub, hairy stems and whorled spines at the nodes. Leaves sessile, often 6 in a whorl, the two outer ones often larger. Flowers purple, Flowering and fruiting is seen in between October to February.

Parts used - Leaf.

Uses : Leaves edible, used for poulticing wounds and in toothache. The juice of the leaves is given to cure dropsy. It is also used in preparation of tonic as blood purifier.

8. Andrographis paniculata (Burm. f.) Wall. ex Nees.

Local Name	:	Chiraita
Oriya Name	:	Bhuinimba
Family	:	Acanthaceae
Place of Collection	:	Gurguria

Erect, glabrous herb, 30-90 cm.; stem square, leaves sessile, flowers pedicellate, solitary, capsule oblong, seeds sub-quadrate, flowering and fruiting is seen in between September to May.

Parts used : Whole Plant

Uses : Herb is an ingredient of a medicine commonly used as a bitter tonic. Plant is used in dysentery, cholera, diabetes and piles. Decoction used for jaundice.

9. Curcuma aromatica Salis.

Local Name	:	Haladi
Oriya Name	:	Banohaladi
Family	:	Zingiberaceae
Place of Collection	:	Gurguria

Rhizome 3.7 cm diameter, branched, aromatic, dirty, white or yellowish inside. Leaves not matured at the time of flowering, leaves are sessile. Flowers pink, 5 cm. long, corolla lobes pink or white. Flowering is seen in the month May.

Parts used - Rhizome.

Uses : In medicine they are used as a substitute for turmeric but not as a condiment. Rhizomes enter into compositions used for bruises and sprains. The rhizome is made

into a paste and applied on the sores of leprosy. Paste of root is applied on wounds once daily for 4-5 days for remedy.

10. Chlorophytum arundinaceum Baker

Local Name	:	Musli
Oriya Name	:	Safed Musli
Family	:	Liliaceae
Place of Collection	:	Hatikot

Herb, root fibres at the ends with thick, cylindrical tubers, greyish-white within. Leaves petiolate oblong. Flowers white star like. Tepals oblong lanceolate, usually acute. Anthers as long as longer than the glabrous filament.

Parts used : Root.

Uses : Roots used as tonic, crushed in rice wash water and the extract is taken twice daily for two days to control dysmenorrhoea. Roots taken as food in fever.

The collected plant species that are being used by the tribals are recorded during the course of survey in the district. Out of the forty species studied the leaves are found out to have medicinal benefits in 20 species, roots of 16 species, fruits of 6 species, bark of 6 species, seed of 6 species, whole plant of 4 species, stem of 3 species, rhizome of 2 species, tuber in two species, flower in two species and other plant parts are having minor benefits .The plants like *Abrus precatorius, Andrographis paniculata, Asparagus racemosus, Cissampelos pareira, Phyllanthus fraternus* and *Bacopa monnierie* are found to be significant from cross cultural point of view.

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SOME PLANTS AND THEIR MEDICINAL VALUES

Mamata Pradhan

In pre-historic age, the subject of human suffering and it's alleviation was intimately associated with religion, myth and magic. In India the references to the curative properties of some herbs in Rig-Veda seem to be earliest records of use of plant in medicine. A more detailed account is available in the Atharva Veda. The two most important work on Indian System of medicine is the work of Charak and susruta, namely the "Charaksamhita" and Susruta Shamhita". With the passing of time., more and more plants are found entering into native medicine, taking the number of India an medicinal herb to about 1500. The question of subjecting medicinal herbs to modern scientific lest has often been raised. Clinical and pharmacological tests on alkaloid extracted from well known and reputed medicinal herbs some times show directly negative results. Whereas such observations should prompt us for careful and critical reassessment of these herbs. There is yet another aspect of the problem (i.e. it is possible that the efficacy of the herb depend on the total effect of the plant contents rather than on the one or few chemical fraction separated from the herbs. More ever, the time of collection. Stage of growth of plant etc. Open or unopened flowers. Young or mature leaves, pre or post flowering stage) locality of natural occurrence or place of cultivation etc. influences the properties of drug.

It has been estimated that out of about 2000 drugs that have been used curing human ailments in India, only about 200 are of animal origin and similar number are of mineral origin. The rest are of plant origin to select only a few from over 1500 medicinal herbs posed considerable difficulty.

Some Plants and their medicinal values :-

1. BAHADA

Botanical name :- *Terminalia bellirica*

Medicinal Value

(a) The trade name Bahada is based on the Indian name of the tree.

(b) The dried Fruit of the tree constitute the drug Bahera.

(c) The Fruit is useful for stomach disorders such as indigestion.

(d) It is also given as a brain tonic and is allied on eyes as smoothing lotion.

(e) Bahera is useful in piles, leprosy, dropsy and fever.

(f) The half ripe fruit is considered to be purgative but the ripe and dried fruit has the opposite property.

2. HENNA

Botanical Name :- *Lawsonia inermis L*

Medicinal Value :-

(a) These plants are generally found in the village and cities of ia. The leaves of the plant have certain medicinal properties.

(b) These are astringents and are used as prophylactic against skin diseases.

© They are applied locally on boils, burns and skin diseases.

(d) A decoction of leaves is use4d to gurgle on sore throat.

(e) The paste of leave is largely used in Indian homes in headache, burning sensation in feet etc.

(f) The leaves have been shown to have some action against tubercular and other bacterial infection, in typhoid and haemorrhagia.

(g) The bark and seeds of the plant are also reported to be used in Ayurvedic and Unani medicine.

(h) It's root also useful for jaundice.

3. TENTULI

Botanical Name :- *Tamarindus indica*

Medicinal Values :-

(a) The pulp of the fruit has medicinal value. Tamarind pulp has laxative properties, it's infusion in water is a very refreshing drink.

(b) It is useful in fever.

© As a laxative, it is taken alone or in mixture with other purgative drugs.

(d) When mixed with other purgative drugs, it reduces their laxative property.

4. SARPAGANDHA

Botanical Name :- *Rauwulfia Serpentina L.*

Medicinal value:-

(a) The drug consists of the dried roots with bark intact preferably collected in autumn and from plants of bout 3-4 years ago.

(b) It is believed that this plant has been used in Indian medicinal preparation for about 4000 years. A mention of the plant is found in charak Sanghita.

© The root contains several alkaloids. The drug is chiefly used as a sedative and hypnotic and reducing blood pressure.

(d) The sedative action of the drug is low and therefore the drug is not useful in acute cases.

(e) It is more suitable for mild anxiety or in patients with chronic mental illness.

(f) The drug has tranquilizing effect. The drug should not be given to persons suffering from bronchitis, Asthma or gastric ulcers.

(g) The roots of the plant are useful also in diseases of bowels and in fever.

5. VACHA

Botanical Name :- *Acrous calamus L.*

(a) The dried rhizomes of the plant constitute the drug "Calamus" and are used in medicine.

(b) Due to presence of volatile oil "Calamus" acts as a caraminative, that is it relieve Flatulence and felling of overfulness of stomach and increase appetite.

© It is considered a household remedy for flatulent colic.

(d) Due to it's essential oil contents, it acts as an expectorant, that is, it promotes flow of bronchial secretions and is useful in diarrhea and dysentery.

(e) "Calamus" also act as emetic and larger doses can cause violet vomiting.

(f) The leaves and rhizomes are also used for flavoring drinks and for preparing insecticides.

6. AONLA

Botanical Name :- *Emblica Officinalis* Gaertn.

Medicinal value:-

(a) The fresh and dried fruits of this tree constitute the drug.

(b) The fruit are one of the 3 constitutes of the well known "Triphala".

© Triphala is used in treatment of enlarged liver, piles, stomach complain, pain in eyes etc. It is a very rich source of Vit C.

It is time for man to check depletion of biodiversity and natural resources. There must be proper management for conservation of all types of natural resources. Otherwise they will be completely exhausted in a few years. We must remember that we have borrowed these resources from our fore fathers. It is our duty to hand over it to over future generation. We can achieve sustainable development of practice this spirit in our day to day life.

More research is necessary for the efficacy of some aurvedic medicines against cancer and AIDS in order to become popular and attractive injectable preparations, capsules and tablet form may be introduced to the market.

Establishment of more number of medicinal herb orchards at National and State level are needed. At domestic level the people should be encouraged to create orchards in their garden to meet their emergency need.

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THERAPEUTIC POTENTIALS OF SOME IMPORTANT MEDICINAL PLANTS

Smita Das

Introduction

Ethnobotany is the study of plants used by specific cultures for various reasons. Ethnobotany is considered a new, yet vast science drawing upon the studies of Botany, Antrhropology, Phytochemistry, Sociology, Medicine as well as Agriculture. The study of ethnic uses of plant species is very important to modern medicines, agriculture, and even the manufacturing industrial sectors of society.

Ethnobotany is the study of plants and people: From 'ethno' – Study of people and From 'Botany' – Study of plants. It is very important as it traces the development of humanity, even the most ancient of civilization relied upon agriculture and the domestication of certain forage, medical, fiber, culinary, and plants used for dyes. In our modern world we use less than 100 species for food, yet there are potentially thousands of plants of which have yet to be seen in our local markets and many of these species are more nutritious and flavorful then the ones purchases, yet every year a new species shows up a "new exotic fruit".

Some of the plants with ethnobotanical importance are discussed below.

***Marsilea Minuta* L. (Marsileaceae)**

1. Plants are used in cough spastic condition of leg and muscle.

2. About 10 gm of whole fresh plant is mixed with 100 gm of curd prepared from black cow's milk. The dosage is given orally once a day in empty stomach for one month against epilepsy.

3. Younger leaves are crushed to extract the juice and 2 drops of juice are dropped in the nostrils twice a day effective in migraine.

***Dryopteris cochleata* (Ham ex D.Chr.) (Dryopteridaceae)**

1. Whole plant extract is given orally twice daily in case of snakebite.

2. powered rhizome is taken with water twice daily in rheumatism and leprosy.

***Asparagus racemosus* Willd.(Liliaceae)**

1. The decoction obtained from the root is used to cure blood diseases, diarrhoea, dysentery, cough, bronchitis and general debility.

2. The root is boiled with cow milk used for increased milk secretion during lactation.

***Achyranthes aspera* L.(Amaranthaceae)**

1. The youngest shoot of the plants are fried with the bulb of *Allium sativa* and are used along with sesame oil internally in case of dog bites and other poisonous cases.

2. Burned root ashes are applied on the teeth which are infected with worms for reducing pain.

***Dendrobium herbaceum* Lindl.(Orchidaceae)**

10 gm fresh leaves are made into paste with 10 gm young shoot of *Andrographis paniculata* and applied on the infected parts twice a day to treat syphilis. The wound are washed after half an hour with leaf decoction of *Azadirachta indica* to avoid over use of decoction.

***Vanda tessellate*(Roxb.) Hook. *ex* G. Don(Orchidaceae)**

1. 50 gm of the root is boiled in 250 ml water until it is reduced to 100 ml; and filtered and cooled. Then, 5 ml of decoction is mixed with 3 to 5 ml of honey ,taken orally on an empty stomach twice a day for one month for treatment of sexually transmitted diseases.

2. The root paste is also used to cure rheumatism and nervous disorders.

***Boerhaavia diffusa* L.(Nyctaginaceae)**

The decoctions of roots are used for the treatment of dyspepsia, jaundice, enlargement of spleen, abdominal pain and as an anti stress agent.

Conclusion

Traditional and indigenous systems of medicine persist all over the world. The unique traditional system of health care that is passed down from generation to generation within the society is still the prevalent system found within the remote areas of country. It is evident that the Santali Tribes of the Similipal region are very knowledgeable about phytomedicines. The present study deals with the therapeutic potentials of some species for treatment of different diseases and ailment

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ETHNOBOTANICAL STUDY OF SIMILIPAL

Fakir Charan Behera

The word "Ethno botany" literally means the study of Botany of the primitive race. The term "ehnobotany" was first applied by **Harshberger(1895)** to the study of plants used by primitive and aboriginal people. This term has been variously defined and interpreted by subsequent workers. **Heiser Jr.** (1984) stated that "ethno botany" is the all types of uses and abuses of plant species by the human beings in general. Ethno botanical studies throw light on certain unknown useful plants and new use of many known plants which can be exploited for developing new sources for some plant products and agro-based industries. Ethno botany is the study of the interaction between plants and people with a particular emphasis on traditional tribal cultures. It is a branch of botany which is closely related to cultural anthropology. Economic botany is the important branch of ethnobotany which focussed on the commercial use of plants. Ethno botanical study of traditional plant lore has resulted in many vulnerable discoveries ranging from new methods for culturing crops on arid lands to new medicines for the treatment of diseases. Rudimentary drugs derived from plants, used in folk medicines have also been found to be beneficial in the treatment of many diseases. Ethno botanical research has also led to the development of many commercial plant derived drugs.

The Similipal Biosphere reserve comes within the central part of the Mayurbhanj district of Odisha between 20degree 17'-22degree34' N Latitude and 85 degree 40'-87 degree10'E Longitudes. It is one of the mega diversity zones of the country with a rich population of flora and fauna. It presents a wide gradient of geological, elevational and climatic features due to high value of biodiversity. It is the biological link between the Northern and Southern India. Similipal Biosphere reserve is very big spreading over an area of about 5569 sq km. It consists of natural ecosystems with varieties of flora and fauna, landscapes, tribes and waterfalls. It is one of the unique treasure house of biodiversity in India containing 93 species of Orchids and 1076 species of other plants, which constitutes 7% flowering plants and 8% Orchids of India. Of these, 02 Orchid species are endemic, 08 species are endangered, 08 are highly vulnerable and 34 species are rare species. Of these 573 species of medicinal plants reported so far, 02 species belong to the rare category (*Rauvolfia serpentina, Hemidesmus indicus*). There are also so many other plants yet to be identified. But the biodiversity is being seriously threatened by human activities. So

before extinction of such plants, they should be ident6ified and proper care must be taken for their conservation.

Thus, Similipal is a treasure of many interesting species of flora and fauna along their variation, which all need to be explored before they get disappeared forever. A large number of medicinal plants, edible fruits, roots and other such products which are providing food,energy,nutrition and medicine to the tribal people need to be studied.There have been so many studies conducted by Mishra, Saxena, Brahmam and others, but an ethno botanical study is necessary for rich flora, vast forest and large tribal population of Similipal Biosphere reserve. Without the help of the tribal people, proper study of flora and their medicinal use is not possible because the tribal people have fairly good knowledge about the medicinal uses of the plants.

Mayurbhanj district of Odisha enriches a great diversity of tribes. Among 62 tribes of Odisha, 45 tribes are found in Mayurbhanj district. In Similipal, the tribes occupy a big chunk of the population. Most common tribes are Kolhas, Santals, Bhumija, Bhuyan, Mahalis etc. Some of these tribes namely Kharias, Mankadias and sabaras are still in the primitive state of living. They depend solely on the surrounding plants for more of their requirements from food to medicine. These tribes have the richest cultural traditions of using medicinal plants. They still depend on the traditional ethno medicine for their day to day primary health care and ailments. This system of using plants in disease treatment has become a part of their culture till recent years. But the entrance of modern economy has given rise to exploitation of the medicinal plants. Again, there are no literary evidences of these traditional practices of the tribes. So there is an urgent need for documentation of these traditional practices and also for a local inventory of medicinal plants, otherwise, the medicinal plants and the system of traditional practices will be extinct in near future.

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SIGNIFICANCE OF EHNOBOTANICAL STUDIES IN SIMILIPAL BIOSPHERE RESERVE

Malati Barik

Studies of medicinal plants based on ancient literature and its investigation in the modern light in known as ethnology.

Since time immemorial plants have been used for the treatment of various diseases. Even today several important drugs used in the modern system of medicine are obtained from plants. The use of medicinal plants has figured in several ancient manuscripts like Rigveda, The Bible etc.

Hippocrates, known as father of medicine was the first person who tried to explain the disease on a scientific basis.

CharakSamhita and Susrutasamhita are two important works dealing with some 700 medicinal plants of India.

The medicinal importance of a plant is due to the presence of some special substance like alkaloids, glycosides, resins volatile oils, gums, tannins etc. These active principles usually remain concentrated in the storage organs of the plant such as root, seed, bark, leaves, etc. Hence medicinal and aromatic plants have been used by the people.

Similipal in the District of Mayurbhanj is rich in medicinal biodiversity. More than 700 species of medicinal plants are known being synonyms with our cultural heritage. The practice of herbal medicine dates back to the very earliest periods of human history.

Odisha has two national parks in order to protect and conserve wild life in their habitat. Similipal Park established in 1980 with 845.70 sq km coverage has animal like tiger, leopard, crocodile, deer, sambar. It is declared the 7th best tiger reserve.

Similipal is filled with plants and animals of multi species of different ages. Starting from civilization, Similipal has been serving the human being. That's why we regard Similipal as a divine gift to the people of Mayurbhanj. It carries out the duties of supplying wood for housing and medicine for health of human being. It has wide application in domestic and industrial fields.

Similipal has some long run activities to help the people of Mayurbhanj. Besides some medicinal plants found in the forest it retains the moisture content of the soil, prevents

drought, floods and soil erosion. It absorbs heat and protect from severe radiation. It controls the humidity of air.

Some of the important medicinal plants present in the Similipal forest and their uses by the tribal people are :-

(a) Amala (*Emblica officinalis*). It is a deciduous tree found in similipal forest and rich source of Vitamin C. The fermented juice of the fruit is used for indigestion, anemia and jaundice. **Triphala** is prepared from its fruits.

(b) Flame of the forest (*Butea monosperma*). It is a medium sized deciduous tree found in the forest. The tribal people used the gum exuded from the trunks in curing diarrhoea and seeds to check roundworm and tape worm.

(c) Kino tree (*Pterocarpus marsupium*). It is a tall deciduous tree. It yield a gum named kino gum. It is astringent and is useful in diarrhoea.

(d) Kochila (*Strychnos nuxvomica*). This plant is Commonly found in the forest. It's seed yield strychnine which is used in the treatment of nervous disorders and paralysis. In lower dosage it is used in curing digestive disorders and dysentery.

Due to accelerated growth of population, urbanization, industrialization and the need for cultivation have encouraged deforestation. Forest property is depleted each year as a result of over exploitation, misuse and conversion into agricultural lands.

Similipal in a natural resource of Mayurbhanj. It fulfills the minimum need of the people. So it can be well protected by the local people by social forestry programme. The awareness programme like Banamohatsav and plantation week can be fruitful in saving forest.

Society of ethnobotany in India was formed in 1981. It has been organizing seminars, workshop on ethnobotany in a regular course to make acquaintance with recent researches in ethnobotany.

Ethnobotany is introduced in the research programme in the health care system for locating life supporting drug plants for the welfare of the mankind.

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ETHNOMEDICINAL PLANTS USED TO CURE DIARRHOEA, DYSENTERY AND CHOLERA BY SOME TRIBES OF MAYURBHANJ DISTRICT, ODISHA, INDIA.

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Abstract

Mayurbhanj is a tribal dominated district situated in the northern part of the state of Odisha. The major ethnic groups of the districts are Santal, Kolha, Bhathudi, Kharia, Mankidias, Gondo and Ho. Due to poor sanitary condition, non availability of safe drinking water and lack of health awareness, the incidence of diarrhoea, dysentery and cholera are very common among the people especially in rural areas. The poor tribes have been using herbal medicines available in and around their habitations to cure various ailments. In connection with a study on "Phytodiversity and phytoresources of forest of Mayurbhanj district, Odisha" about 118 flowering plant species belonging to 101 genera under 57 families have been reported having use for the treatment of diarrhoea, dysentery and cholera by some of the major tribes . The indigenous knowledge on use of the plants have been documented through extensive fieldwork. These ethno medicinal claims may aid in screening and finding novel biomolecules.

Key words: Ailments, Conservation, Ethnomedicinal, Mayurbhanj, Traditional knowledge.

Introduction

Medicinal plants are often easily accessible health care alternatives for the most of rural and tribal population across the world. Indigenous people have been using the natural resources for their sustenance including healthcare. They possess broad base knowledge of the complex ecological system existing in the vicinity of their habitat. The knowledge accumulated by tribals during a long series of observation from one generation to another is transmitted through oral communication for power possessed by medicinal plants in treatment of various ailments.

Allopathic drugs have brought a revolution throughout the World but the plant based medicines have its own unique status. Nearly 80% of the World population depends upon traditional system of health care (WHO, 1993; Ishtiaq *et al.*, 2006b; Mishra *et al.*, 2012).India

has centuries old heritage of medicinal plants and herbal medicines for curing human illness & promotion of health in tribal & rural areas.

There are about 42 million cases annually and an estimated 75,000 deaths across the globe due to amoebic dysentery alone (Jamil *et al* , 2003).According to an estimate of WHO every year about 58 million people suffer from diarrhoea resulted in death, illness and disability caused due to unsafe drinking water, hygiene and sanitation.

Dysentery is an affliction characterised by inflammation of the large intestine or colon. It may be caused by certain protozoa like *Entamoeba histolytica* (cause amoebic dysentery or amoebiasis) , *Bacillus subtilis* and *B. cereus* (Bacillary dysentery).Some other micro organisms which cause dysentery and diarrhoea are *Escherichia coli, Shigella flewxneri, S. dysenteriae* and *Campylobacter* sp. Diarrhoea is characterised by an increase in frequency and fluidity of stools. The cause of diarrhoea may be due to food poisoning, viral infection, allergy to certain food, bacterial infection, indigestion etc. Cholera is an acute epidemic disease caused by an organism called *Vibrio cholerae*. The main symptoms are evacuation of copious rice water stools accompanied by agonizing cramp and severe collapse. It spreads mainly through contaminated water and poor sanitary conditions. (Melookunnel, 2000; Kar, 2012). Due to poor sanitary condition, non availability of safe drinking water, lack of hygienic awareness, the incidence of diarrhoea, dysentery and cholera are very common among the rural and tribal in district of Mayurbhanj. The tribes of the district depend on the herbal medicines those are available in and around their habitation for treatment of various diseases. The indigenous knowledge on the use of plants for therapeutic uses is vanishing. Keeping in view of the above said facts an attempt has been made to document the ethnomedicinal plants used for curing diarrhoea, dysentery and cholera in the district.

Study area

Mayurbhanj is tribal dominated district with a total geographical area of 10,418 sq.km. and is situated in the northern tract of the state of Odisha. It lies between 21°16' and 22°34' North latitude and 85°40' and 87°11' East longitude. The Simlipal hill ranges are located in the central part of the district. The geological formations of the district chiefly belong to meso proterozoic age, mio-pliocene age and recent geological periods. The soil of the district may be broadly classified into red and laterite soil. The reddish and sandy soil favours the luxuriant growth of Sal, the dominant tree of the district.

Mayurbhanj district enjoys tropical monsoon climate & receives the maximum rainfall of 158 cm per annum. An unpleasant hot and humid summer followed by the monsoon between June and November and a severe cold winter characterizes the general climate of Mayurbhanj. May is the hottest month when the mean daily maximum temperature rises up to 47° Celsius. During the month of December, the mean daily minimum temperature often dips to 4° Celsius. Relative Humidity is quite high throughout the year. At places, it reaches upto 90% during the months of June & July. Mayurbhanj district is adobe of various tribes. Out of 45 tribes the major tribal communities of the district are Santal, Kolha, Bathudi, Kharia, Mankidias, Gondo and Ho.

Materials and method

Regular field trips were conducted in selected tribal pockets of Mayurbhanj district from Dec. 2009 to July 2012 in connection with a study on "Phytodiversity and phytoresources of forest of Mayurbhanj", ethnobotanical observation was conducted by scouting in the study area. The information was gathered by own observations and interviewing with individual persons or a group of people in tribal communities. The traditional herbal healers were also contacted to collect information. The local name of plant taxa and part used were meticulously recorded. To phytotherapeutic uses of the plants are also ascertain by referring published literatures of Jain, 1991; Kirtikar and Basu, 1991; Ambasta *et al*, 1992; Chopra *et al* ,1996. The voucher specimens were collected and identified with the help of floras (Haines, 1961; Mooney, 1950; Saxena & Brahmam, 1994-96; Singh *et al*, 2001; Murty & Panigrahi, 1989). Then the correct nomenclature of the taxa were assigned according to ICBN (Greuter *et. al.*, 1994) and preserved using standard methodology and housed in Herbarium, P.G. department of Botany , North Orissa University, Takatpur, Baripada, Odisha. The ethnomedicinal plants are listed with the botanical names with family, local name in odia, part(s) used for treatment and ailments (Table- 1).

Results & discussion

As many as 118 flowering plant taxa belonging to 101 genera under 57 families have been reported during the study. Out of which, 6 monocotyledonous families are represented by 7 species and 51 dicotyledonous families are represented by101 species.

The Ethnomedicinal uses of plants in treatment of diarrhoea, dysentery and cholera are represented below.

Table -1.

Name of Taxa	Family	Local Name	Parts used	Ailments
Acacia catechu (L.f.) Willd	Mimosaceae	Khoira	Bark	Diarrhoea
Acacia leucophloea (Roxb.) Willd.	Mimosaceae	Gohira	Bark	Diarrhoea
Acacia nilotica (L.) Delile	Mimosaceae	Babala	Leaf	Diarrhoea, Dysentery
Achyranthes aspera L.	Amaranthaceae	Apamaranga	Root	Dysentery
Aegle marmelos (L.) Corr.	Rutaceae	Bela	Leaf, Fruit	Diarrhoea
Ageratum conyzoides L.	Asteraceae	Poksunga	Root, Leaf	Diarrhoea, Dysentery
Alangium salvifolium (L.f) Wang.	Alangiaceae	Ankula	Bark	Dysentery
Albizia lebbeck Benth.	Mimosaceae	Sirisa	Bark	Diarrhoea
Allium cepa L.	Amaryllidaceae	Piaja	Bulbs	Dysentery
Allophylus serratus (Roxb.) Kurz	Sapindaceae	Patta nai	Whole plant	Diarrhoea
Alstonia scholaris (L.)R.Br.	Apocynaceae	Chatina	Bark	Diarrhoea
Andrographis paniculata (Burm.f) Wall.ex Nees	Acanthaceae	Bhuinimba	Leaf, root	Dysentery
Annona reticulata L.	Annonaceae	Barhial	Fruit	Dysentery
Anogeissus latifolia (Roxb.ex DC) Wall.ex Guill.&Perr.	Combretaceae	Dhau	Bark	Diarrhoea
Anthocephalus chinensis (Lam.) A.Rich.ex.Walp.	Rubiaceae	Kadamba	Bark	Diarrhoea
Ardisia solanacea Roxb.	Myrsinaceae	Tinkol	Root	Diarrhoea
Asparagus racemosus Willd.	Liliaceae	Satabari	Root	Diarrhoea, Dysentery
Azadirachta indica A.Juss.	Meliaceae	Nimbo	Leaf	Diarrhoea, Dysentery
Barringtonia acutangula (L.) Gaertn.	Barringtoniaceae	Hinjala	Leaf	Diarrhoea, Dysentery
Bauhinia purpuria L.	Caesalpiniaceae	Kuliari	Bark	Diarrhoea
Bauhinia racemosa Lam.	Caesalpiniaceae	Anmata	Bark	Dysentery
Bauhinia vahlii Wight & Arn.	Caesalpiniaceae	Siali	Bark	Dysentery
Bauhinia variegata L.	Caesalpiniaceae	Kanchana	Bark	Dysentery
Boerhavia diffusa L.	Nyctaginaceae	Ghodapuruni	Root	Diarrhoea,Dysentery, Cholera
Boswellia serrata Roxb.	Burseraceae	Salia	Bark	Diarrhoea
Butea monosperma (Lam.)Taub.	Fabaceae	Palasa	Flower,Seed	Diarrhoea
Calotropis gigantea R. Br.	Asclepiadaceae	Arakha	Root	Diarrhoea

Calotropis procera (Ait.) R. Br.	Asclepiadaceae	Arakha	Root	Cholera
Canthium dicoccum (Gaertn.) Teijsm. & Binnend.	Rubiaceae	Kurma	Root, Leaf	Diarrhoea
Careya arborea Roxb.	Barringtoniaceae	Kumbhi	Bark	Diarrhoea, Cholera
Catunaregam spinosa (Thunb.) Tirveng	Rutaceae	Potua kanta	Bark	Diarrhoea, Dysentery
Celosia argentea L.	Amaranthaceae	Manjur chulia	Flower	Dysentery
Centella asiatica (L.) Urban	Apiaceae	Thalkudi	Whole plant	Dysentery
Cissampelos pareira L.	Menispermaceae	Akanabindi	Leaf	Dysentery
Citrus limon (L.) Burm. f.	Rutaceae	Bana lembu	Fruit	Diarrhoea
Citrus medica L.	Rutaceae	Lembu	Root	Dysentery
Clausena excavata Burm.f.	Rutaceae	Agnijhal	Root	Dysentery
Cleome viscosa L.	Capparaceae	Bono sarisha	Whole plant	Diarrhoea
Commelina benghalensis L.	Commelinaceae	Kansera	Whole plant	Dysentery
Curcuma angustifolia Roxb.	Zingiberaceae	Palagunda	Root	Cholera, Dysentery
Cynodon dactylon (L.) Pers.	Poaceae	Duba	Leaf	Diarrhoea
Cyperus rotundus L.	Cyperaceae	Mutha	Rhizome	Diarrhoea
Diospyros melanoxylon Roxb.	Ebenaceae	Kendu	Bark	Diarrhoea
Diospyrus malbarica (Desr.) Kostel.	Ebenaceae	Mankada Kendu	Bark	Diarrhoea, Dysentery
Elephantopus scaber L.	Asteraceae	Tutamuli	Root, Leaf	Diarrhoea
Emilia sonchifolia (L.) DC	Asteraceae	Sarkara	Whole plant	Diarrhoea
Erycibe paniculata Roxb.	Convolvulaceae	China katha	Bark	Cholera, Dysentery
Ficus benghalensis L.	Moraceae	Bara	Bark	Dysentery
Ficus racemosa L.	Moraceae	Dimiri	Milky latex	Diarrhoea
Gardenia gummifera L. f.	Rubiaceae	Bhurudu	Resin	Diarrhoea, Dysentery
Gardenia resinifera Roth.	Rubiaceae	Dokamali	Resin	Diarrhoea, Dysentery
Grewia abutilifolia Vent.ex A.L.Juss	Tiliaceae	Mirga	Bark	Dysentery
Grewia helicterifolia Wall.ex.G.Don	Tiliaceae	Kukurbhendi	Fruit	Diarrhoea, Dysentery
Haldinia cordifolia (Roxb.) Ridsd.	Rubiaceae	Koima	Root	Diarrhoea, Dysentery
Helicteres isora L.	Sterculiaceae	Murimurika	Root, Bark	Diarrhoea, Dysentery
Hibiscus rosa-sinensis L.	Malvaceae	Mandara	Twig	Dysentery

Holarrhena pubescens (Buch.-Ham.) Wall.ex G.Don	Apocynaceae	Kuruchi	Stem, Bark	Dysentery
Indigofera cassioides Rottl.ex DC.	Fabaceae	Gilirl	Root	Dysentery
Ixora pavetta Andr.	Rubiaceae	Telakuruma	Root	Diarrhoea, Dysentery
Justicia adhatoda L.	Acanthaceae	Basanga	Leaf	Diarrhoea
Kalanchoe pinnata (Lam.) Pers.	Crassulaceae	Amarpoi	Leaf	Dysentery
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	Moi	Bark	Diarrhoea, Dysentery
Lawsonia inermis L.	Lythraceae	Manjuati	Leaf	Diarrhoea, Dysentery
Leea indica (Burm.f.) Merr.	Vitaceae	Kalad chana	Root,leaf	Diarrhoea, Dysentery
Limonia acidissima L.	Rutaceae	Koitha	Fruit	Diarrhoea, Dysentery
Litsea glutinosa (Lour.) Robins	Louraceae	Ledha chali	Bark	Diarrhoea, Dysentery
Mallotus philippensis (Lam.) Muell.-Arg.	Euphorbiaceae	Sinduri	Fruit	Dysentery
Mangifera indica L.	Anacardiaceae	Amba	Bark	Diarrhoea,Dysentery, Cholera
Melastoma malabathricum L.	Melastomataceae	Korali	Leaf	Diarrhoea, Dysentery
Mimusops elengi L.	Sapotaceae	Baula	Bark	Diarrhoea, Dysentery
Morinda citrifolia L.	Rubiaceae	Achhu	Root	Dysentery
Moringa oleifera Lam.	Moringaceae	Sajana	Leaf	Dysentery
Murraya koenigii (L.)Spreng	Rutaceae	Bhursunga	Leaf	Diarrhoea, Dysentery
Nicotiana tobacum L.	Solanaceae	Tamaku	Leaf	Diarrhoea
Nyctanthes arbor-tristis L.	Oleaceae	Gangasiuli	Leaf	Dysentery
Ocimum canum Sims	Lamiaceae	Ganga tulasi	Leaf	Dysentery
Ocimum sactum L.	Lamiaceae	Tulasi	Leaf	Diarrhoea
Oroxylum indicum (L.) Vent.	Bignoniaceae	Phampana	Bark, Leaf	Dysentery
Paederia foetida L.	Rubiaceae	Pasaruni	Leaf	Dysentery
Phyllanthus emblica L.	Euphorbiaceae	Aanla	Leaf	Diarrhoea, Dysentery
Phyllanthus fraternus Webster	Euphorbiaceae	Bhuianala	Whole plant	Dysentery
Piper longum L.	Piperaceae	Pippali	Whole plant	Cholera
Piper nigrum L.	Piperaceae	Golomaricha	Seed	Diarrhoea
Plumbago zeylanica L.	Plumbaginaceae	Dhala chitaparu	Root	Diarrhoea
Pogostemon benghalensis (Burm.f.) Kuntze	Lamiaceae	Gonda-dulia	Leaf	Dysentery

Psidium guajava L.	Myrtaceae	Pijuli	Leaf	Diarrhoea
Pterocarpus marsupium Roxb.	Fabaceae	Piasala	Bark	Dysentery
Pterocarpus santalinus L.f.	Fabaceae	Chandana	Fruit	Dysentery
Punica granatum L.	Punicaceae	Dalimba	Leaf	Diarrhoea
Quisqualis indica L.	Combretaceae	Madhu malati	Seed	Diarrhoea
Rauvolfia serpentina (L.) Benth.ex.Kurz.	Apocynaceae	Patal garuda	Root	Dysentery
Rubia cordifolia L.	Rubiaceae	Rangachireita	Root	Diarrhoea, Dysentery
Saraca asoca(Roxb.)de Wilde.	Caesalpiniaceae	Osako	Bark, Flower	Dysentery
Securinega virosa (Roxb.ex willd).Baill	Euphorbiaceae	Kanilehya	Bark	Diarrhoea
Sesamum orientali L.	Pedaliaceae	Khasa	Leaf	Cholera, Dysentery
Shorea robusta Gaertn.f.	DipterocarpaceaeSala		Resin	Diarrhoea
Sida acuta Burm.f.	Malvaceae	Bajra muli	Leaf	Dysentery
Spilanthes calva DC.	Asteraceae	Roipura	Flower	Dysentery
Spondias pinnata (L.f.) Kurz.	Anacardiaceae	Ambada	Bark	Diarrhoea
Streblus aspera Lour.	Moraceae	Sahada	Bark	Dysentery
Strychnos nux-vomica L.	Strychnaceae	Kochila	Root	Cholera
Syzgium cumini (L.)Skeels	Myrtaceae	Jamu	Bark	Diarrhoea
Tamarindus indica L.	Caesalpiniaceae	Tentuli	Bark	Diarrhoea
Tamilnadia uliginosa (Retz.) Tirveng.	Rubiaceae	Telkuruma	Root	Diarrhoea, Dysentery
Terminalia arjuna (Roxb.ex DC.) Wt. & Arn.	Combretaceae	Arjuna	Bark	Diarrhoea
Terminalia bellirica (Gartn.) Roxb.	Combretaceae	Bahada	Bark	Dysentery
Terminalia chebula Retz.	Combretaceae	Harida	Bark	Dysentery
Thalictrum foliolosum DC.	Ranunculaceae	Bharada	Rhizome	Dysentery
Tinospora cordifolia (Willd.) Hook.f.& Thoms.	Menispermaceae	Guluchi	Root, Stem	Diarrhoea, Dysentery
Trapa natans L.	Trapaceae	Pani singada	Fruit	Dysentery
Trema orientalis (L.) Bl.	Ulmaceae	Kharkas	Root	Diarrhoea
Trewia nudiflora L.	Euphorbiaceae	Pani Gambhari	Leaf	Dysentery
Tridax procumbens L.	Asteraceae	Bisyala karani	Root	Diarrhoea
Vitex negundo L.	Verbenaceae	Begunia	Root, Leaf	Cholera

Woodfordia fruticosa (L.) Kurz.	Lythraceae	Dhatiki	Flower	Dysentery
Wrightia tinctoria (Roxb.)R.Br	Apocynaceae	Pita karua	Bark	Diarrhoea
Zingiber officinale Rosc.	Zingiberaceae	Oda	Rhizome	Diarrhoea
Ziziphus mauritiana Lam.	Rhamnaceae	Borkoli	Bark	Diarrhoea, Dysentery

Among 57 families recorded, the families like. Rubiaceae, Rutaceae and Caesalpiniaceae are having more than five taxa with medicinal uses. In this regard, Rubiaceae is the most dominant family (Fig-1). The plant parts used are rhizome, root, bark, leaves, seed, flower, resin or whole plants. The aerial parts of the plants are mostly used in comparison to that of underground parts. It was revealed that 42 plants are used to cure dysentery, 40 plants are used to cure diarrhoea, 4 plants are used to cure cholera, 3 plants are used both for cholera & dysentery. Two plants namely *Boerhavia diffusa* L. and *Mangifera indica* L. are used for diarrhoea, dysentery and cholera. The recorded ethnomedicinal species exhibit various life forms, of which 54 species are trees, 27 species are shrubs, 29 species are herbs and 08 species are climbers. (Fig -2).

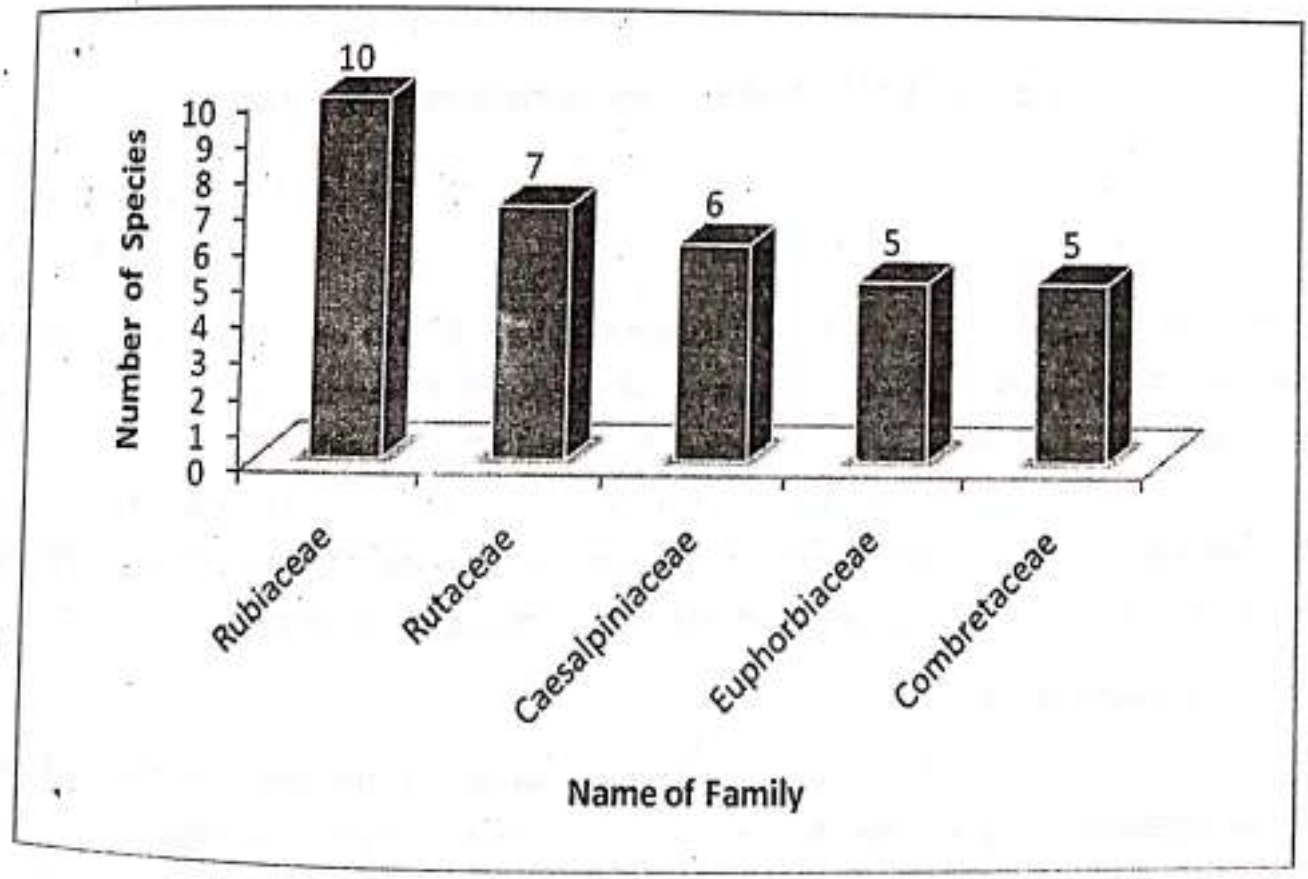

Fig. – 1: Dominant families with no. of species used in medicine

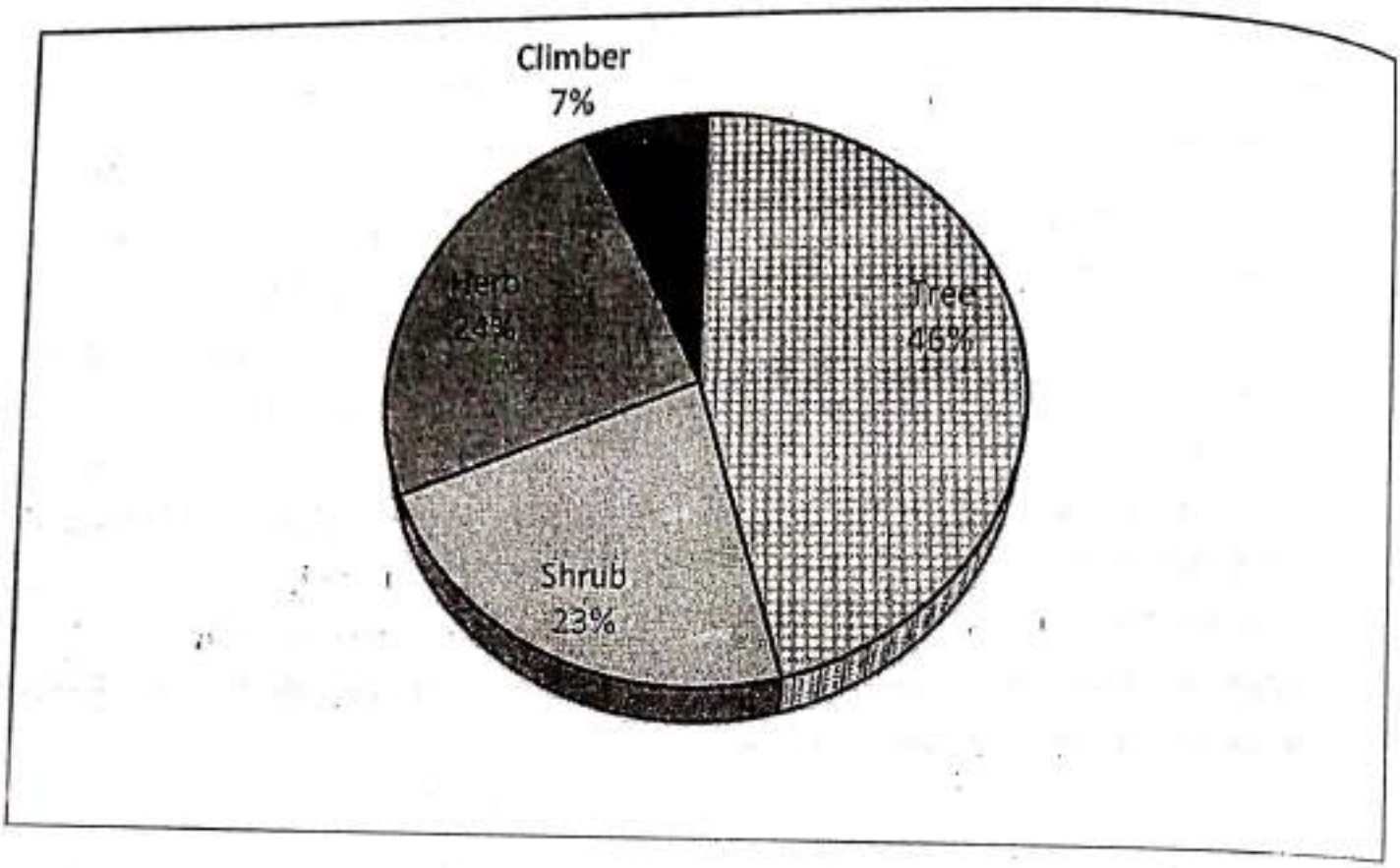

Fig. – 2 : Life form of ethnomedicinally important plants.

Conclusion

The present study indicates that, Mayurbhanj district is rich in vegetable wealth having ethnomedicinal properties that may cure wide spectrum of ailments. It is also evident that knowledge of medicinal plant is limited to traditional healers, elderly people and tribals from rural areas. Therefore it becomes necessary to acquire and preserve traditional knowledge through proper documentation and identification of specimens which also support for the conservation and management of biological resources.

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ROLE OF SOIL MICROBES IN SUSTAINABLE AGRICULTURE

S. K. Jena and C.C. Rath

Abstract

The relationship among soil, microbes and plants in a ecosystem functioning is of major scientific concern today. Microbes are absolutely essential for the survival of higher forms of life including humans, animals and plants. Most important role , microbes play for agriculture are nitrogen fixation, phosphate solubilization, sulphur solubilization and biocontrol activities. Studies concentrated to find out the novel microbes and how that can be used as biofertilizers with biocontrol properties in modern agricultural practices.

Introduction

Soil is a natural medium that favours the growth and multiplication of most varieties of microorganisms. In soil, microorganisms play an important role in decomposing minerals, composting the complex organic and inorganic substances, and made it available to the plants. A special group of microorganisms or specially bacteria are known as plant growth promoting rhizobacteria that colonize in plant roots, and in doing so, they promote plant growth either by mineralization and production of growth factors or by controlling the plant pathogens available in soil by production of antimicrobial compounds. Plant growth promoting bacteria enhances crop productivity by increasing soil fertility such as increasing nitrogen fixation, increasing supply of other nutrients (Phosphorus, Sulphur, Iron, Copper etc.), producing plant growth hormones, enhancing growth of other beneficial bacteria and fungi, controlling various fungal and bacterial diseases. The mode of action by which biofertilizers enhance the nutrient status of host plants can be categorized into some important (1) biological $N_2$2 fixation; (2) increasing the availability of nutrients in the rhizosphere (*e.g.* solubilization of phosphorus, sulphur, iron etc.); (3) inducing increases in root surface area; (4) enhancing other beneficial symbioses of the host such as arbuscular mycorrhizae and phytohormone production; 5) production of enzymes that decrease phytohormone production by the host, induction of the host to produce signal substances to other symbionts (*e.g.* flavonoids); and (6) combination of modes of action (Lucy *et al.*, 2004 & Nautiyal *et al.*, 2000)

Soil Type and Microbial Diversity

Weathering of parental rocks result in the development of several loose layers or horizons of weathered materials, Biological system, addition of organic matter (humus) and interaction between organic and mineral compounds make the horizons down to the level of undifferentiated parent materials is called soil profile. The soil profile may be divided into following zones or horizons. i.e. (1) Top horizon: It is composed of decaying organic matter (dead plants, animals and microflora) often called Humus. In this horizon the microbial activity is intense. It is very loose and it supports vegetation. as it is full of organic elements and minerals (2) Second horizon: A zone of soil present below the top soil, known as subsoil. In this zone, the weathered substances or minerals are deposited and organic residues are present in very small quantities. It contains decomposed organic matter where aerobic microbial activity is at it's peak. (3) Third horizon: This zone is made up of sub-soil containing minerals and leached humus. It has no organic matter, therefore, anaerobic microbes live here. (4) Fourth horizon: it is the soil base containing bed-rock with no microbial activity (Sidhu 2003).

Soil samples are collected for microbial enumeration from different soil horizons in the laboratory, will find variable number of different types and kind of microbes. One gram of soil containing tons of millions of microbes. Approximately, 75-95 percent of the total microbial population is found within the upper 10 centimeters of soil . This is due to the presence of organic matter on which the microbes feed and decompose. But the number is low at the surface of the soil because of exposure to ultraviolet radiation. Of course, soil contains microbes, but their number is reduced by the harsh activity of so many chemicals currently used on agricultural practices.

The rhizosphere is the region of soil closely surrounding the plant roots, has the most dense population of microbes. This region contains, approximately, 10 billion bacteria per grams of soil which is five to twenty folds greater than the root-free-soil. In this region plant roots and microbes interact and help each other to flourish life cycle. Plants excrete such as sugars, amino acids and vitamins for the microbes. But microbes, in turn, produce organic compounds, enzymes and hormones that metabolize food for plants. Particularly, bacteria help plants to take up macronutrients (N, P, K, Ca, S etc.) and micronutrients (Zn, Fe, Mn, B, Mo, Co, Cu).

Role of Microbes in Plant Nutrition

Different microbes have definite role for maintenance of soil nutrients for plants and other organisms. Such as *Pseudomonas* species are aerobic and are most abundant in the lively rhizosphere. *Bacillus* species are spore forming aerobic species, help in the metabolism of Nitrogen, Phosphorous and Manganese compounds for the plants. *Rhizobium* species are aerobic bacteria that fix atmospheric nitrogen in the roots of leguminous crops such as peas, lupine, alfalfa etc. *Rhizobium* species are also abundant in the rhizosphere. Actinomycetes are aerobic microbes, feed on complex molecules like celluloses, sugars, polysaccharides, lipids, chitins and proteins. Actinomycetes make other microbial work easy by splitting complex compounds into simpler molecules. They improve the structure and texture of the soil and impart a pleasant musty odour reminiscent of freshly turned soil. Actinomycetes also produce antibiotics that keep in check some bad microbes (Sidhu 2003).

Phosphate Solubilizing Microorganisms(PSM)

Phosphorus (P) is a major growth-limiting nutrient, and unlike the case for nitrogen, there is no large atmospheric source that can be made biologically available (Ezawa *et al.*, 2002). Root development, stalk and stem strength, flower and seed formation, crop maturity and production, N_2-fixation in legumes, crop quality, and resistance to plant diseases are the attributes associated with phosphorus nutrition. Large amount of P applied as fertilizer enters in to the immobile pools through precipitation reaction with highly reactive Al_3+ and Fe_3+ in acidic, and Ca_2+ in calcareous or normal soils. Efficiency of P fertilizer throughout the world is around 10 - 25 % (Isherword, 1998. Soil microorganisms play a key role in soil P dynamics and subsequent availability of phosphate to plants (Richardson, 2001). Strains from bacterial genera *Pseudomonas*, *Bacillus* and *Rhizobium (Bacillus megaterium*, *B. circulans*, *B. subtilis*, *B. polymyxa*, *B. sircalmous*, *Pseudomonas striata*, and *Enterobacter)* along with *Penicillium* and *Aspergillus* fungi are P solubilizers strains, commonly reported in literature (Khan *et al.*, 2009, Khiri and Parent, 2005).

Sulphur Oxidizing Microorganisms

Deficiency of sulpher leads to reduction in growth rate of the plant and generally the growth of shoots were more affected than that of roots. Sulphur deficient plants were yellow small and spindle with short slender stalks. Legumes usually require almost equal

amount of phosphorus and sulphur. When phosphorus and sulphur are present below the critical level in the soil, plant growth and quality of produce are affected adversely. The sulphu oxidizing microorganisms are primarily the gramnegative bacteria currently classified as species of *Thiobacillus, Thiomicrospira* and *Thiosphaera*, but heterotrophs, such as some species of *Paracoccus, Xanthobacter, Alcaligens* and *Pseudomonas* can also exhibit chemolithotrophic growth on inorganic sulphur compounds (Vidyalakshmi, 2009).

Biological Nitrogen Fixation and Symbiosis

Biologic nitrogen fixation can be an important source of nitrogen for supporting aquatic primary productivity. Nitrogen is one of the most essential elements for all forms of life; a basic material for synthesizing proteins, nucleic acids and other organic nitrogenous compounds. Unfortunately no plant species is able to reduce atmospheric dinitrogen into ammonia and use it directly for its growth. It appears that only a number of prokaryotic microorganisms including bacteria and *Cyanobacteria* have been found in the nodules on the roots (and occasionally, stems). This symbiosis provides the bacteria with an exclusive niche and, in return, the plants obtain a personalized nitrogen source. They occur in the so - called free - living forms e.g. aerobic *Azotobacter*, anaerobic Clostridia or in symbiosis with certain higher plants e.g. *Rhizobia* with legumes or *Azolla (Anabaena azollae)*. The potential for biological nitrogen fixation is increased greatly by the fact that there is a close relationship between plants and nitrogen Prokaryotes. Nitrogen fixing prokaryotes are able to make completely useful associations with plants: from loose associations to intercellular symbioses. There exist associative symbioses in which nitrogen fixing prokaryotes (e.g. *Azospirillum, Azotobacter, Enterobacter species* have been found to occur in rhizosphere of different plants such as sugarcane, maize wheat, rice, grasses and others (Shridhar, 2012)

Biocontrol Activities of Microbes

There is an intense competition among microbes in the rhizosphere. In this process they learn to reduce the number of each other by producing poisonous compounds such as antibiotics or toxins. The interactions between microorganisms and plant hosts

can be complex. Interactions that lead to biocontrol can include antibiosis, competition, induction of host resistance, and predation (Cook and Baker, 1983). When, testing bacterial and fungal isolates from the environment for biocontrol activities, between 1 and 10% show at least some capacity to inhibit the growth of pathogens *in vitro*. Currently in USA, a number of biologically-based products are being sold for the control of plant diseases. A growing number of companies are also developing new products that are in the process of being registered. Several microorganisms isolated from different soil environments posses antagonistic activities against various phytophathogens. These can be used to control plant diseases (being caused by several phytophatogens) and be commercially exploited as biocontrol agents. Some of the relevant examples are given below.

Biofertilizers for sustainable agriculture

A more sustainable agriculture that is 'ecologically sound, economically viable, socially just and humane' should aim to recycle minerals in the soil with no or few external inputs, maintain a high biodiversity in agroecosystems, favour mechanical and biological weed control, and better exploit soil-plant-microbe interactions for plant nutrition and protection against pests. An answer to this is the biofertilizer, an environmentally friendly fertilizer now used in many countries. During the last couple of decades, the use of biofertilizers-PGPR for sustainable agriculture has increased tremendously in various parts of the world. The main sources of biofertilizers are PGPR, beneficial rhizospheric fungi such as arbuscular mycorrhizae and *Penicillium bilaii* and Cyanobacteria (blue-green algae) that are long known to have plant growth promoting effects via increasing the nutrient status of host plants . Recorded important benefits from biofertilizers include: 1) Increasing crop yield by 20-30%; 2) replacing chemical nitrogen and phosphorus by 25%; 3) activating the soil biologically; 4) restoring natural soil fertility; and 5) providing protection against drought and some soil-borne diseases In adition, some PGPR appear to promote growth by acting as both biofertilizer and biopesticide. For instance, strains of *Burkholderia cepacia* have been shown to have biocontrol characteristics to *Fusarium* spp., but also to stimulate growth of maize under iron-poor conditions via siderophore production (Bevivino *et al.*, 1998). The overall simplified methods of using biofertilizers are presented in Fig. 2.

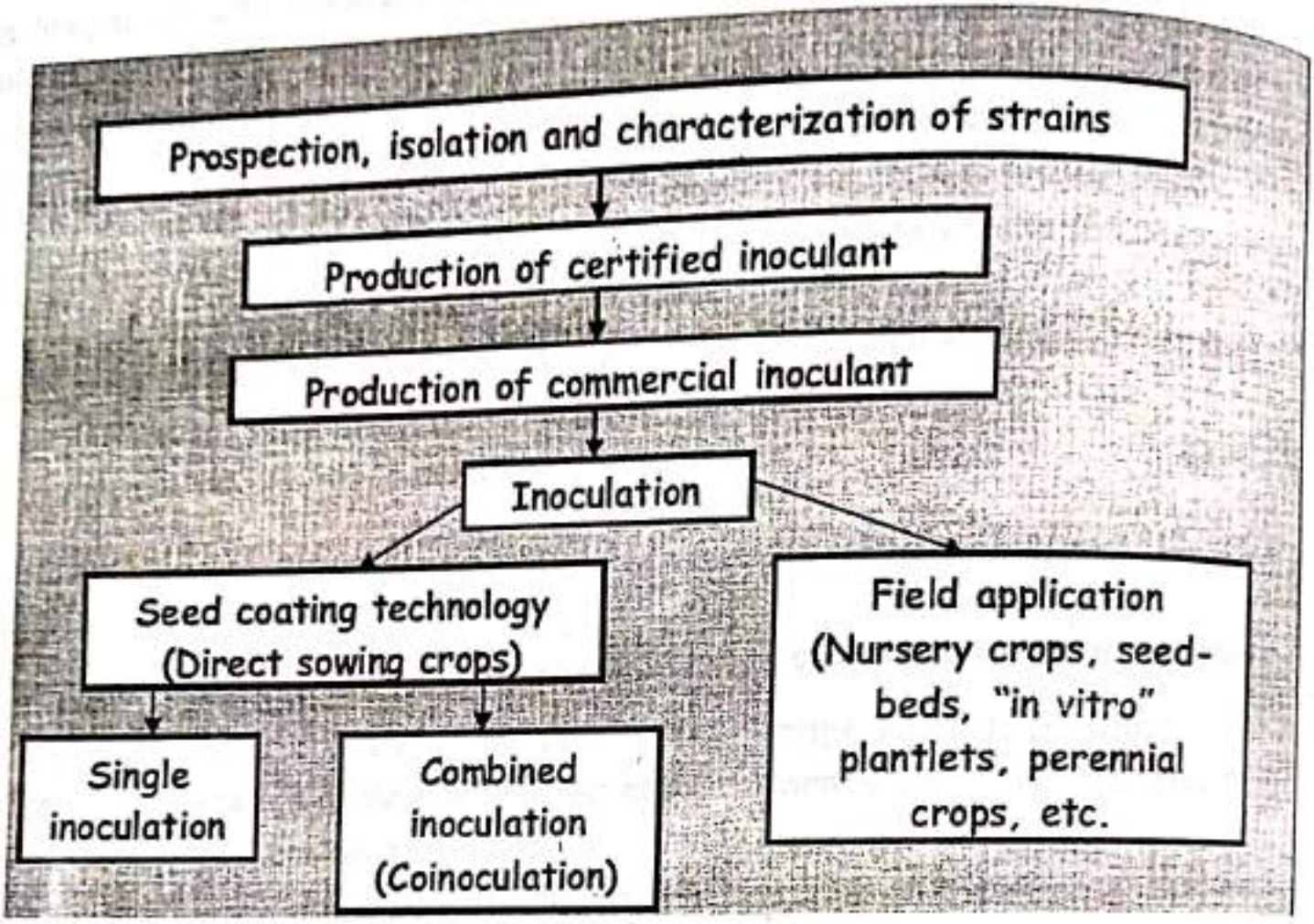

Fig. 2. General methodology for obtaining and using biofertilizers.

Generally biofetilizer in powder form are applied as for organic matters onto soil. This very important and convenient for users on management of biofertilizer . some biofertilizer very costly product for farmer, it uses is restricted for a definite agronomical condition. Microorganisms are generally supplied by producers of biofertilizer, so it would only necessary that the users or farmers follow the application method prepared by manufacturers (Verma, 1993 & Vessey, 2003). Now day, researches aim to search novel microbes having Phosphate solubilizing , Sulpher solubilizing , nitrogen fixation and biocontrol activity could be explored as a plant growth promoting microbes in sustainable agriculture.

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NEED FOR CONSERVATION OF MEDICINAL PLANTS OF MAYURBHANJ

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1. Mayurbhanj lies between 21° 17' and 22° 34' North latitude and between 85° 40' and 87 ° 10' East longitude covering an area of 10,418 sq kms.
2. This district is bestowed with mountains of varied altitudinal ranges, innumerable rivers and streams and varied topographic conditions.
3. It harbours a rich vegetation in forest area of 4392.13 sq kms. Sal (*Shorea robusta*) is the most dominant species.
4. It receives the maximum rainfall of 158 cm per annum.
5. There are about 1356 species of plants of which 578 species are of medicinal value, out of which about 80 species are commercially exploited.
6. There is tremendous potentiality of cultivation of medicinal plants in this hill-studded forest ecosystem.
7. In general, plants species are depleting fast due to anthropological pressures like forest fire, diversion of natural forests for non forestry purposes like mining, industry, hydro-electricity, reclamation of agriculture urban infra-structure etc. In the process, most of the medicinal plant species are shrinking.
8. Increasing commercial demand for medicinal plants due to overpopulation explosion has brought this invaluable resource under severe pressure.
9. The result of conservation Assessment and Management Prioritization (CAMP) work-shop organized during October 2007 in Bhubaneswar, exclusively to assess the threats to medicinal plants in the State, reveals that 41 medicinal plants are Red listed. Of these 2 species have been assessed to be the critically endangered (danger of extinction) 11 as endangered while 26 are vulnerable (likely to move to the endangered category).
10. Medicinal Plants in Trade: A study conducted recently at all India level enlist around 640 species in trade of which 20 are exotic and involve import of these plants/ products, 550 species are native and involve collections such as collection of entire plant (16.5%); rhizome ,root, bark and stem (53%) and collection of reproductive parts(22%).

11. The rapid depletion of medicinal plants from the wild demand urgent conservation action. A total of 95 species currently in trade have so far been assessed under "threatened" categories which need conservation immediately.

12. The conservation activities are in general addressed to the problems like increase in population, indiscriminate tree felling, forest fire, shifting cultivation, land use changes, reclamation for agricultural land, over-exploitation of minor forest products, trampling of agricultural crops, industrial and mining activities cultivation of hybrid varieties, population, use of chemical fertilizers, pesticides and insecticides, introduction of exotic plants which change the soil condition, increasing demand and supply of medicinal plants, all these pave the way for speedy depletion of the such resources from the area.

At present no uniform policy/act to regulate exploitation, extraction and export of medicinal plants exists in the state. The Wild Life Protection Act, 1972 do not provide adequate safeguards.

To conserve this important forest wealth, it is necessary to consider the following steps:-

1. Launching campaign for creating awareness among general public.
2. Launching a programme to preserve ,conserve and multiply the species which are threatened and at the verge of extinction.
3. To identify the endangered, threatened and rare plants of this district.
4. Launching of a campaign to cultivate species which have natural habitat in the different physioclimatic zones.
5. Creation of herbal gardens of different climatologically zones.
6. Attention should be given to allow the plants to grow in their natural habitat, ie *in situ* conservation.
7. Export of species should be banned/restricted/centralized.
8. Enforcement of legislation for conservation and preservation of medicinal plants
9. Species in huge demand should be allowed to be cultivated in sanctuaries, national parks, ex nurseries, experimental gardens, Botanical gardens etc.
11. Tissue culture and biotechnological technique to be adopted in case of rare endangered plants, i.e.ex situ conservation.

12. Utmost importance should be given to protect the habitat. Otherwise habitat destruction may lead to depletion and extinction of the species.

13. Gene banks (seed banks) should be established in every state to preserve the genetic resources for preservation.

14. Local people should be involved in conservation practices paying them some incentives in order to make the programme a successful one. If the rural people or tribal's are not benefited, there will be reactions and the aim of conservation will be in peril.

15. Suggestions from experts are necessary whenever required for successful implementation of the conservation programme.

16. Tree felling, forest fire and podu cultivation being the main causes of depletion of forest wealth, strict laws should be enforced to restrict such activities.

17. The critical and immediate need therefore is to bring about a balance in our approach to conservation and sustainable use of this vast and priceless natural heritage.

18. To ensure access of medicinal plants to village communities for their primary health care needs, so that they will conserve and manage resources.

19. To develop cadre of taxonomists, Para-taxonomists and forestry professionals to support and sustain rapid surveys with respect to medicinal plant conservation status and to monitor changes on a long term basis.

20. Instead of chemical insecticides, pesticides and fertilizers, use of bio fertilizers and bio pesticides should be encouraged form healthy environment of soil and water.

21. Remedial steps for protection, preservation and conservation of these plants is the need of the hour so that depletion and extinction can be checked and controlled through large scale cultivation for commercial purposes.

22. Deployment of large number of task force in the forest and establishment of vigilance cell.

23. Cryopreservation methods should be adopted to conserve the germ plants for longer period.

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NEED FOR ETHNOBOTANICAL STUDIES OF SIMILIPAL BIOSPHERE RESERVE

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ABSTRACT

Similipal Biosphere Reserve (SBR) in Mayurbhanj district of Odisha is the most luxuriant forest and rich in medicinal plant resources. The forest area is dominated by a number of tribes such as Kol, Santal, Bhumij, Mankidias and Khadias who depend on the forest for their food to medicine. The present paper reports on ethno medicinal uses of 25 potential medicinal plants belonging to 20 families for treatment of various diseases like leucorrhoea, spermatorrhea, piles, sore throat, rheumatism elephantiasis etc. by Kol tribe living in some villages situated in and around Similipal Biosphere Reserve. The botanical name family name, vernacular name, parts used, method of preparation, usage, administration of the drugs are given in this paper.

INTRODUCTION:

For centuries plants have been an important source of drugs. Many plant extracts are well established in clinical practice and are likely to remain so far sometime until better, cheaper, less toxic or more efficacious alternatives become available. Of the pharmacologically active principles found in plant kingdom, higher plants are arguably most important group. Many plants are used with medicinal properties and cover a broad spectrum of pharmacological effects. It is especially meaningful in tropical countries due to great variety of plants belonging to their eco-system. In India medicinal plants have long been used to treat different kinds of diseases. Today there is an increasing desire to unravel the role of ethno botanical studies in trapping the centuries old traditional folk knowledge as well as in searching new plant resource of food, drugs etc.

Throughout the world, plants have been in continuous use in one way or the other for the treatment of various ailments. In India the scared Vedas, which date back between 3500 B.C and 800 B.C., give many references of medicinal plants. The indigenous traditional knowledge of medicinal plants of various ethnic communities, where it has been transmitted orally for centuries is fast disappearing from the face of the earth due to the advent of modern technology and transformation of traditional culture. The collection

of information about natural flora, classification, management and uses of plants by the people holds importance among the ethno botanists.

Globally, about 85% of the traditional medicines used for primary healthcare are derived from plants. Herbal drugs obtained from plants are believed to be much safer, this has been proved in the treatment of various ailments. Traditional medicine and ethno botanical information play an important role in scientific research, particularly when the literature and field work data have been properly evaluated. The local people and researchers face the challenging task of not only documenting knowledge on plants, but also applying the result of their studies to biodiversity conservation and community development with a deep concern and reverence for the vast diversity of flora that our country enjoys, and with sense of realization about the invaluable therapeutic properties of this phytodiversity.

DISCUSSION:

The ethno medicinal uses of 25 plant species recorded from the Kol tribes of similipal Biosphere Reserve are discussed in table given below. It is evident from the present study that the tribals are dependent on a variety of medicinal plants for treatment of various ailments. Some experienced tribals gave idea about the cure of some important diseases like diarrhoea, chronic dysentery, chronic constipation, piles, snakebite, rheumatism, diabetes, leucoderma of skin and urine infection.

The ethno-medicinal information provided in this study is new, as they have not been reported earlier. Thus, the information presented provides enough opportunities to study their active principles in terms of searching the modern drugs. Although these herbal remedies and their efficacy is claimed to be high detail clinical and experimental studies are needed for better utilization of ethno botanical knowledge.

It was learnt that the Kohl tribes of Similipal Biosphere Reserve either work as labourers or cultivate crops such as paddy, Mandia, Jhoar and mostly depend on forest and the forest products to sustain their livelihood. The tribals inherit rich traditional knowledge about the medicinal uses of flora investigated and apply this knowledge for making crude phytomedicines to cure infections of ailments from simple cold to other complicated diseases. Traditional knowledge forms the basis for origin of not only alternative medicine but also paved way to evolution of a gamut of new and novel modern medicine. But this knowledge is mostly unknown to scientific world and faces

slow and natural death. It is paradoxical to see the modern world of late, focusing more on alternative medicine which has herbal base predominantly.

Ethnomedicinal uses of plants in similipal Biosphere Reserve, Odisha.

S. No	Botanical name, family and local names	Parts used	Ailments	Mode of preparation
1.	*Agave sisalana* peer.ex Engl., Agavaceae, Sisal(or.)	Leaves	Tongue infection	Leaf juice applied with honey on tongue
2.	*Alstonia scholaris*(L.) R.Brown, Apocynaceae, Chhatina(or.)	Bark	Jaundice	Decoction of bark along with bark of piper triocum, Mangifera indica and piper nigrum(10-15 nos) taken twice a day for 3 days
3.	*Andrographis paniculata* (Burm.f.) Wall ex Nees, Acanthaceae, Bhuineem(or.)	Whole plant	Headache	Entire plant is made into paste and applied externally on forehead.
4.	*Atylosia scarabaeoides*(L.) Benth., Fabaceae, Birhorre(K)	Root	Rheumatism	Roots are ground together with Vitex negundo(tender leaves), Kaempferia rotunda(root), Clausena excavate(root) and boiled in pongamia pinnata oil and the oil is applied externally.
5.	Calotropis *gigantea*(L.) W.T. Aiton, Asclepiadaceae, Patladhudha(or.)	Root	Malaria	Approximate 4 inch each two pieces root is boiled in 400ml

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				cow milk for 5-10 minutes and filtered juice is taken one teaspoon mixed with sugar for treatment of malaria and once in a month as preventive
6.	*Careya arborea* Roxb. Lecythidaceae, Kumbhi(or.)	Bark	Piles	50gm stem bark is boiled with water and taken(1 glass) in empty stomach once a day for 7 days
7.	*Cassia fistula* . L. Fabaceae, Sonari(or.)	Leaves	Constipation	Half teaspoon juice extract is taken orally thrice a day.
8.	*Catharanthus roseus*(L.) G. don, Apocynaceae, Sadabihari(or.)	flower	Diabetes	Infusion of young leaves and flower is taken in morning daily
9.	*Clausena excavata* Burm.f., Rutaceae, Agnijhal(or.)	Root	Bodypain	Root is made into a paste and given internally. Roots are boiled and the water is taken against dysentery.
10.	*Crotalaria spectabilis* Roth, Fabaceae, Jhunka(or.)	root	Dysentery	Juice extract is given orally
11.	*Curculigo orchioides* Gaertn, Hypoxidaceae, Talmuli(or.)	Tuber	Snakebite	Tuber is made into paste and applied externally as an antidote

S. No	Botanical name, family and local names	Parts used	Ailments	Mode of preparation
12.	*Curcuma amada* Roxb. Zingiberaceae, Amahaladi(or.)	Whole plant	piles	Paste of 7 long peppers(piper longum) mixed with 3 gm of plant paste each used teice for 3 days for the treatment of piles.
13.	*Dalbergia latifolia* Roxb.. Fabaceae, Sisso(or.)	Oil	Eczema	Oil is applied externally to treat eczema
14.	*Desmodium gangeticum*(L.) DC Fabaceae, Salaparni(or.)	Root	Fever	Decoction of root is taken in empty stomach once for 5 days to cure fever.
15.	*Elephantopus scaber* L. Asteraceae, Talmuli(or.)	Root	Urine infection	Root paste is twice a day for a week for the treatment of pain during discharge of urine
16.	*Kaempferia rotunda* L. Zingiberaceae, Bhuichampa(or.)	Bulb	Ulcer	Along with root of Swertia angustifolia and honey made paste given orally twice a day till cure.
17.	*Litsea glutinosa*(Lour) C.B. robinson, lauraceae, ledhachhali(or.)	Bark	Wound	Paste is applied on wound to heal up faster.
18.	*Nyctanthes arbortristis* L., Oleaceae, Chirat, Saparon(K.)	Leaves	Cough & cold	Young leaves of Zingiber officinale,

S. No	Botanical name, family and local names.	Parts used	Ailments	Mode of preparation
				piper triocum(root) are taken together in equal quantites, boiled with water and taken twice a day for three days.
19.	*Oroxylum indicum*(L.) Kurz, Bignoniaceae, Ringevenam(K.)	Bark	Appetite	One glassful decoction of bark is taken orally in the morning for 3 days to simulate appetite.
20.	*Pterocarpus marsupium* Roxb., Fabaceae, Piasal(or.)	Bark	Blood dysentery	Paste is made with bark of above plant pounded with *Mangifera indica* (bark), *Shorea robusta* (bark) and spondias pinnata(bark of 2 inch size each and administered once in a day
21.	*Scoparia dulcis* L. scrophulariaceae, chiranta(Ko)	Leaf	Sore throat	Decoction of leaf is taken twice continuously for a week for the treatment of sore throat.
22.	*Rauvolfia serpentina*, (L.) Benth. Ex Kurz, Apocynaceae, chhedabag(K.)	Root	Malaria	Roots are ground with roots of *Cissampelos pereira*

S. No	Botanical name, family and local names	Parts used	Ailments	Mode of preparation
				in equal quantities with water and taken orally twice a day for 5 days.
23.	*Withania somnifera*(L.) Dunal, solanaceae, Ashwagandha(or.)	Flower	Spermatorrhea	Decoction of flower is taken with honey once a day in empty stomach for one month for the treatment of spermatorrhea.
24.	*Woodfordia fruticosa*(L.) kurz. Lythraceae, icha(k.)	Tender leaves	Dysentery	Juice is good for treating dysentery.
25.	*Zizphus rugosa* Lam. Rhamnaceae, chunkoli(or.)	Bark	Dyspepsia	Decoction is given orally.

Conclusion:

Here I want to show that knowledge and usage of herbal medicine for the treatment of various ailment among tribes is still a major part of their life and culture. Here I observed that they use some herbaceous plants as traditional medicine although many of these species are known as medicinal plants. The data collected show that majority of medicines are taken orally. Most of the reported preparations are drawn from a mixture of plants; single plant is used rarely. In other parts of the country, the use of mixtures of plant species in treating a particular ailment is fairly common. Generally, the people of the area in SBR still have a strong belief in the efficacy and success of herbal medicines. The result of the present study provide evidence that medicinal plants continue to play an important role in the healthcare system of kol tribal community of similipal Biosphere Reserve, Orissa.

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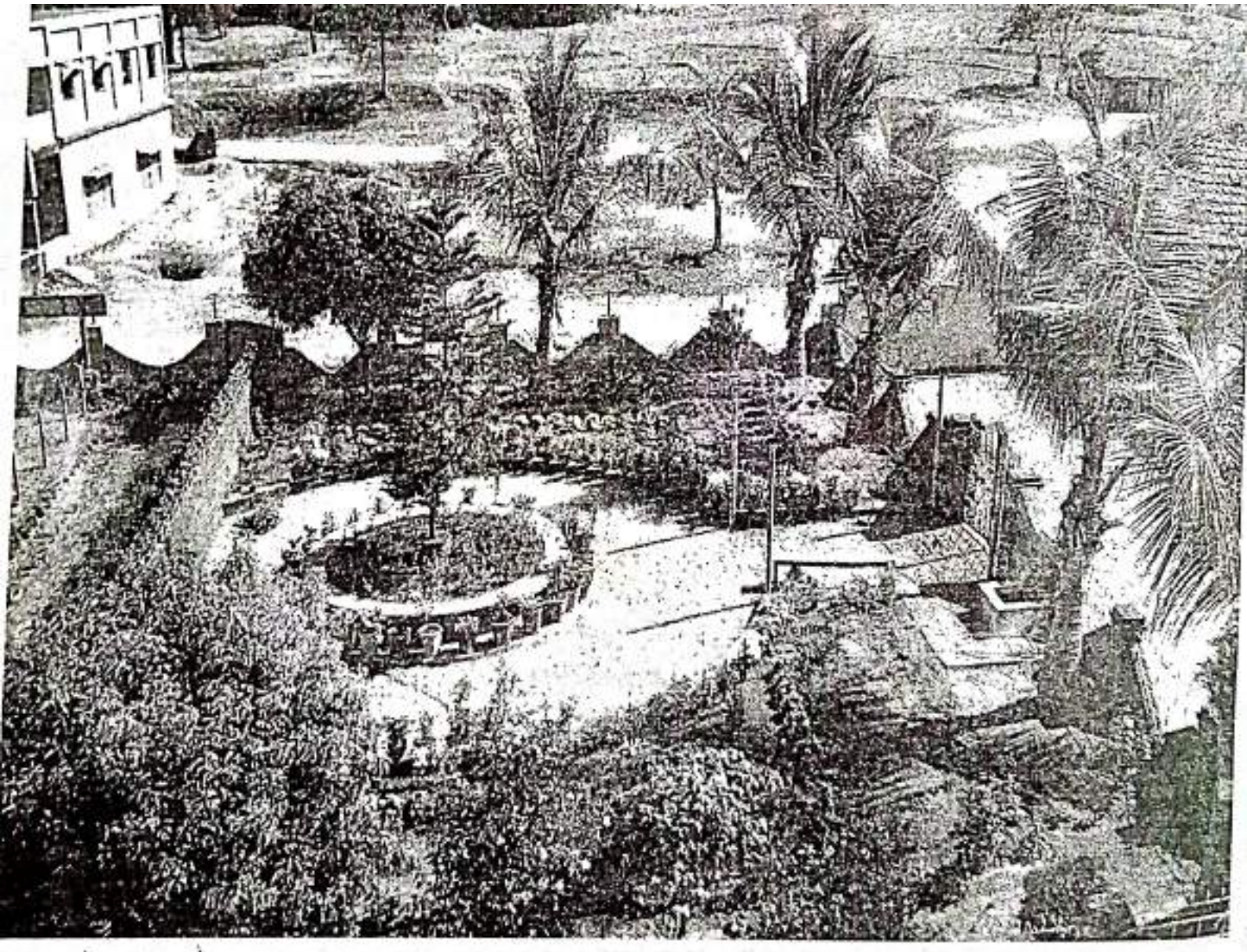

An ariel view of the College Garden