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# Centurion Journal of Multidisciplinary Research



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## **About the Journal**

### **Centurion Journal of Multi-disciplinary Research**

Centurion Journal of Multi-disciplinary Research is a refereed journal, which serves as a platform for exploring the current issues, challenges and linkages in the broad areas of development, technology, engineering and management. There is a special focus on skill development and education, its recognition and promotion in the country, especially with the 'Make in India' initiative by the government of India. The objective of the journal is to facilitate bringing together research based contributions in science, technology, management and skills that has direct implication for the development of under-privileged communities and empowering them. The journal links theory and practice in the above areas so as to have policy and programme implications, particularly in under-developed contexts. In addition to articles from individuals or collectives, the journal publishes book reviews.

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- Providing a platform for debate and dissemination of research findings, conceptual developments and new research areas and techniques that promise to change analyses and perspectives on science and technology, development, management, skill in developing societies;
- Disseminating and promoting research, good practice and innovation in all aspects of science, technology, management and skill development to its main audiences, including educators, researchers, graduate students, policy makers, and practitioners; and
- Encouraging multi-disciplinary cooperation and understanding, and enhancing quality research.

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## **Editorial**

Documentation of plant wealth is very important for the progressive science in the field of ecology, ethnobotany, pharmacology and future drug formulation. It gives a basic idea on ecological changes, medicinal properties of plant wealth and raw material from unexplored plants for drug formulation. The current issue of the journal gives a glimpse of the floral wealth including the antibacterial and toxicity of plant extracts to fight against microbial infections and other lethal diseases & disorders like cancer and diabetic. There is a need to highlight the importance of non-timber forest products and bring attention towards food chemistry, microbiology and livelihood management for sustainable development. The current issue of the Journal also published very informative papers and documented basic things like the importance of NTFPs. Non-Timber Forest Products plays an important role in the life of local people and the tribal communities of an area. People from a wide range of socioeconomic, geographical and cultural context harvest NTFPs for a number of purposes like maintenance of culture and tradition, spiritual fulfillment, animal feeding, learning and as a source of income. Some wild edible mushrooms are also collected for food which comes under NTFPs. The most common NTFPs of Odisha from insect is red ant commonly called as “Kai”. People make chutneys and take it to treat cold. The forest provides a lot of facilities. Hence, major step needs to take to conserve the NTFPs as well as the forest. Tree and climber species are very important and have medicinal potential, which is discussed here. The formulation of new drugs is need of the hour during the pandemic COVID-19. Therefore, it is needed to bring attention in this aspect and document the medicinal and pharmacological values of medicinal plants against pathogenic bacteria followed by the herbal formulation. The papers of current issue also highlight the importance of medicinal trees. From a paper, I observed that they have reported about 50 medicinal tree species belonging to

24 families. Among them, Fabaceae have a large number of species followed by Moraceae, Combretaceae and Caesalpiniaceae. Due to overexploitation and climate change, some plants are going to the threatened level. Hence, we need to conserve the trees as well as to document their medicinal uses for future study. Climbers also play an important role. They are morphologically different from the other plants. They also possess some medicinal values and can be used to treat many ailments. From a paper, it is found that most of the climbers are used to treat ailments like fever, cold, inflammation etc. It has less harm than the chemical drug for which it gets a special attention for health care. Hence, more study needs to do to know the medicinal values and more data should be collected for future use which will be helpful in drug development. Most of the people depends on chemical drugs and show less interest in the medicinal plants for which they are going to the threatened level. In some developing and developed countries major technology are carried out to produce plant derived medicine because it has less or no side effects. Hence, the main duty of people is to protect and conserve the medicinal herb. It is also necessary to record their beneficial information for future uses. The medicinal plant product can be a good source to develop new drugs in future. Herbal drugs have also an emphasized role in maintaining the oral hygienic nature as well as preventive dental caries. The polyherbal formulation play a vital role in human healthcare like one multiple formulation containing *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* is feasible to be used as mouth rinse and tooth paste. This formulation was successfully evaluated using different standard parameters including antimicrobial properties in a published paper of the current issue. The extracts showed promising antimicrobial effect against *Streptococcus mutans* involved in dental caries and periodontal diseases. Hence, this formulation may be considered as a simple and effective alternate to chlorhexidine for preventing and controlling dental caries. Authors have described that the formulation may be safer compared to fully synthetic or chemical drug. Authors also indicated that further studies are need to prove safety and efficacy of the formulated drug. The study demonstrates *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* have antibacterial

activity against *Streptococcus mutans*. The above research & reports revealed that people throughout the world again started to use the herbal products and formulation against the diseases and disorders to reduce the problems of side effects and also herbal formulations are cost effective. Such trends could give the platform for the sustainable utilization of plant and their parts in different life stuffs and ecological balance. There is an urgent need to document the unexplored plants from different landscapes and their uses with local community to establish the community conservation in the state at root level.

**Dr. Susanta Kumar Biswal**

# Contents

## Articles

- Non-Timber Forest Products of Rairangpur,  
Mayurbhanj, Odisha, India  
*Subhadarshini Satapathy, Sugimani Marndi and Sanjeet Kumar* 1
- Some important medicinal trees of Rairangpur,  
Mayurbhanj, Odisha, India  
*Subhadarshini Satapathy, Sweta Mishra and Sanjeet Kumar* 12
- A note on *Streptococcus pyogenes* and  
plants used against its pathogenic action  
*Pratima Murmu and Sanjeet Kumar* 24
- Some medicinal Climbers of Rairangpur,  
Mayurbhanj, Odisha  
*Subhadarshini Satapathy, Sugimani Marndi and Sanjeet Kumar* 33
- Some important medicinal herbs of Rairangpur,  
Mayurbhanj, Odisha  
*Subhadarshini Satapathy, Sweta Mishra and Sanjeet Kumar* 42
- Formulation of Novel Drugs from  
Selected Plants Against *Streptococcus*  
*mutans* Causing Dental Caries  
*Soumya Priyadarshini Mishra & Sanjeet Kumar* 53



# **Non-Timber Forest Products of Rairangpur, Mayurbhanj, Odisha, India**

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**Subhadarshini Satapathy<sup>1</sup>, Sugimani Marndi<sup>1</sup> and  
Sanjeet Kumar<sup>1,2</sup>**

## **Abstract**

Non-Timber Forest Products plays an important role in the life of local people and the tribal communities of that area. People from a wide range of socioeconomic, geographical and cultural context harvest NTFPs for a number of purposes like maintenance of culture and tradition, spiritual fulfilment, animal feeding, scientific learning and income. Rairangpur is situated in Mayurbhanj district of Odisha. It is mostly dominated with the tribal communities who depend on the forest product for their livelihood. This study represents the NTFPs found in Rairangpur and their uses and the study reveals that about 30 plant species are used to harvest NTFPs and used for the purpose of medicine, food and their daily income. Some wild edible mushrooms are also collected for food. The most important NTFPs of Rairangpur is red ant commonly called as “Kai”. People make chutneys and take it to

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treat cold. The forest provides a lot of facilities. Hence, major step needs to take to conserve the NTFPs as well as the forest.

**Keywords:** Food, Livelihood, Medicine, NTFPs, Tribal community

## **Introduction**

In the last decades there is a rapid growth of interest on the Non-Timber Forest Products (Marshall et al., 2003). There are many reasons for the general spread of global interest in NTFPs. It can contribute significantly to the livelihoods of tribal communities (Marshall et al., 2005). Millions of people use the forest product for their livelihood and this is termed as Non-Timber Forest Products (Shackleton and Shackleton 2004). NTFPs obtained from plant resources including seeds, flowers, fruits, leaves, barks, latex, resins and other plant parts. They have a much attention in conservation (Tickton 2004; Pandey et al., 2016). NTFPs fulfil multiple function in supporting human well-being. It provides food, shelter, medicine, fiber and energy to many of the world's poorest people (Hegde and Enters 2000; Saha and Sundriyal 2012). Non-timber forest products are goods of biological origin. The NTFPs referred to as all the resources or product occur from forest and utilized within the household or one marketed or have social, cultural and religious value (Marshall et al., 2003). Most of the rural house hold in developing countries as well as people of urban areas depends on the product to meet some part of their nutritional, health, house construction or other needs (Shackleton et al., 2015). As NTFPs helps to improve the rural livelihood. So, global interest is increasing day by day (FAO 1995). About 50 % of 70 % forest-based export income come from the non-timber forest product (Chauhan et al., 2008; Shiva and Verma 2002). One third of rural population got their livelihood from the NTFPs. In the traditional forest community, many NTFPs are a part of household substance strategies which provide macro-nutrients, carbohydrates, fats and proteins (F.A.O 1992). It may be a staple food for the community living near forests. It also used as a livestock. NTFPs also include medicinal plants as an important source or raw material for traditional system of medicine such as Siddha, Unani and Ayurveda (Goi 2000; Ahenken and Boon 2011). Most of the modern medicines

are based on plant and their extract. According to World Health Organisation, about 80% of the world population depends on the plant derived medicine as their primary source of healthcare (Frakin 2006). Hence, forest products should be conserved to get forest product in future.

## Methodology

### Study area

The present study was carried out in Rairangpur (Figure 1). The survey was made from the month of January to July 2021. The study includes ethnobotanical survey in field, interviews with local people and data collection. Regular field trips were carried out to villages, forests and markets. The information about the Non-Timber Forest Products were collected by questionnaires with local people. Information on diversity of species of herbs used as medicine were gathered and the scientific and local name were assigned immediately on the spot. The detailed information on the products, their scientific names, common name and uses were recorded. By different quarries with local people the uses of NTFPs were cross-checked and the plant specimens were identified with the help of “Flora of Orissa” (Saxena and Brahmam, 1995) and “Botany of Bihar and Orissa” (Hains 1921-1925).



**Figure 1:** Study area

## Results and Discussion

The present study reveals that the tribal of Rairangpur depend on the forest products for their livelihood, livestock and also for their healthcare. Mostly, they collect leaves, flowers, fruits, mushrooms and some animal product like red ant etc (Figure 2).

### A) Plant products

#### 1. *Amorphophallus campanulatus*

**Common name:**Olua

**Family:**Araceae

**Uses:** Tuber can be eaten cooked.

#### 2. *Anacardium occidentale*

**Common name:** Kaju

**Family:** Anacardiaceae

**Uses:** Fruit and seeds are used as food.

#### 3. *Artocarpus heterophyllus*

**Common name:**Panasa

**Family:**Moraceae

**Uses:** Fruits are used as food.

#### 4. *Asparagus racemosus*

**Common name:**Satavari

**Family:**Asparagaceae

**Uses:** Roots are used as medicine to cure Rheumatics.

#### 5. *Azadirachta indica*

**Common name:** Neem

**Family:**Meliaceae

**Uses:** Whole plant is used as medicine to treat skin diseases. Flowers can be eaten cooked.

#### 6. *Bambusaarundinaceae*

**Common name:** Karadi



**Family:** Poaceae

**Uses:** Young shoots are eaten cooked.

**7. *Bauhinia vahlii***

**Common name:** Siali

**Family:** Fabaceae

**Uses:** People eat the burnt seed. Leaves are used to make leaf plates.

**8. *Buchanania lanzan***

**Common name:** Chara

**Family:** Anacardiaceae

**Uses:** Fruits are edible.

**9. *Centella asiatica***

**Common name:** Thalkudi

**Family:** Apiaceae

**Uses:** It is used as medicine for memory power.

**10. *Colocasia esculenta***

**Common name:** Bana saru

**Family:** Araceae

**Uses:** Tubers are used as food.

**11. *Curcuma angustifolia***

**Common name:** Paluo

**Family:** Zingiberaceae

**Uses:** Tubers are used as food.

**12. *Cynodon dactylon***

**Common name:** Duba

**Family:** Poaceae

**Uses:** It is used as food for cattle.

**13. *Dillenia aurea***

**Common name:** Bada rai

**Family:**Dilleniaceae

**Uses:** Fruits are used as food.

**14. *Dioscorea alata***

**Common name:**Khambaalu

**Family:**Dioscoreaceae

**Uses:** Tuber can be eaten cooked.

**15. *Dioscorea bulbifera***

**Common name:** Pita alu

**Family:**Dioscoreaceae

**Uses:** Tuber can be eaten cooked. Tuber decoction is used to treat acidity.

**16. *Dioscorea oppositifolia***

**Common name:**Panialu

**Family:**Dioscoreaceae

**Uses:** Tubers are edible.

**17. *Dioscorea pentaphylla***

**Common name:**Karba

**Family:**Dioscoreaceae

**Uses:** tubers are edible.

**18. *Diospyros melanoxylon***

**Common name:**Kendu

**Family:**Ebenaceae

**Uses:** Leaves are used to make bidis. Fruits are edible.

**19. *Ficus racemose***

**Common name:**Dimiri

**Family:**Moraceae

**Uses:** Fruits are edible.

**20. *Ficus semicordata***

**Common name:**Bhuindimiri

**Family:**Moraceae

**Uses:** Roots are used in Folk medicine.

**21. *Madhuca longifolia***

**Common name:** Mahua

**Family:**Sapotaceae

**Uses:** Flowers are used to make country liquor.

**22. *Pongamia pinnata***

**Common name:** Karanja

**Family:** Fabaceae

**Uses:** Seeds are collected to extract oil which have a great medicinal property.

**23. *Schleichera oleosa***

**Common name:** Kusum

**Family:**Sapindaceae

**Uses:** Seeds are used to extract oil.

**24. *Shorea robusta***

**Common name:** Sal

**Family:** Dipterocarpaceae

**Uses:** Leaves are used to make leaf plates. People collect resins from *Shorearobusta*.

**25. *Syzigiumcumini***

**Common name:** Jamu

**Family:** Myrtaceae

**Uses:**Berries are edible. It is also taken to treat diabetes.

**26. *Terminalia bellerica***

**Common name:** Bahada

**Family:** Combretaceae

**Uses:** Fruit is used as medicine.

**27. *Terminalia chebula***

**Common name:** Harida

**Family:** Combretaceae

**Uses:** Fruits are used as medicine.

**28. *Thysanolaena latifolia***

**Common name:** Broom grass (E)

**Family:** Poaceae

**Uses:** It is used to make brooms.

**29. *Tinospora cordifolia***

**Common name:**Guduchi

**Family:**Menispermaceae

**Uses:** The whole plant used as medicine.

**30. *Woodfordia fruticosa***

**Common name:** Dhatiki

**Family:** Lythraceae

**Uses:** Flowers are used as medicine to treat diabetes.

**B) Mushrooms**

Mushrooms are collected from the forest and consumed by local people. It also helps them in income and medicine.

**C) Red ants**

Red ants locally known as “Kai” are the major NTFPs for the tribal people of Rairangpur. They collect it from the forest used to make chutneys. They believed that it will help to cure cold.

**D) Honey**

People collect honey from the forest. They use it for their daily need. Also, they can get a good source of income by selling it in the market.





Flowers of *Madhuca longifolia*



Red ant



Wild edible mushrooms



*Syzgium cumini*



Broom grass



*Diospyros melanoxylon*



Honey



*Buchanania lanzan*

**Figure 2:** Some important NTFPs of study areas

## **Conclusion**

Most of the people depends on the NTFPs for their daily need. The NTFPs also help the communities financially. Due to daily harvesting process some of the plants are going to threatened level. Hence major step should be taken to conserve the NTFPs.

## **Acknowledgement**

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# Some important medicinal trees of Rairangpur, Mayurbhanj, Odisha, India

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Odisha, India

**Subhadarshini Satapathy<sup>1</sup>, Sweta Mishra<sup>1</sup> and Sanjeet Kumar<sup>1,2</sup>**

## Abstract

Odisha is known for the floral diversity. Rairangpur is one of the city in Odisha which is present near to Similpal Biosphere Reserve (Deepest forest of Odisha). Rairangpur enjoys a great diversity of Sal Forest. It has moist deciduous and dry deciduous forest. Also, there are many valuable trees having medicinal properties. The study was carried out to document the medicinal trees and their uses for future study. From the present study, about 50 medicinal tree species are found belonging to 24 families. Among them, Fabaceae have a large number of species followed by Moraceae, Combretaceae and Caesalpiniaceae. The botanical name, family, common name, parts used, mode of use and medicinal uses are mentioned. Due to overexploitation, climate change etc. some plants are going to the threatened level. Hence, we need to conserve the trees as well as their medicinal uses for future study.

**Keywords:** Tree, Mayurbhanj, Medicinal values

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## **Introduction**

Always plant plays an important role in the Traditional System of Medicine to cure many ailments world-wide. The demand of medicinal plant is increasing day by day in both developed and developing countries (Soni et al., 2012). About 60-8-% of world's population depend on the medicinal plants for the treatment of common ailments and diseases (WHO 2002; Rao et al, 2004). Traditional medicines are less expensive, easily available and don't have any side effects also reach to poor people since the plant in and around the home serves as a primary source of medicine. This system of medicine is accepted throughout the globe (Schippmann et al., 2002). About 4,22,000 plant species have been reported worldwide for their medicinal values (Baul and Mohiuddin 2011). Traditional System of Medicine is widely practise on many accounts. Population increases, inadequate supply of drug, high cost of treatment side effects of many chemical drugs led to drag interest on the use of plant materials as a source of medicine for many human ailments (Matkowski et al., 2008).

India has been known to be rich in plant diversity. The Indian forests enjoys a great diversity of medicinal and aromatic plants which play an important role as a raw material for manufacturing of drug (McCune and Johns 2002). About 8,000 herbal remedies have been described in Ayurveda which are still used in classical formulation in Ayurveda System of Medicine. Ayurveda, Siddha, Unani and Folk medicines are the major part of Indigenous medicine (Kalaivanni and Mathew 2010).

Green plant preserves and synthesize a variety of biochemical product, many of which are extracted and use in drug development and other scientific investigation. Many secondary metabolites of plant are used in many pharmaceutical compounds. Sometimes it is very difficult to extract drug due to the factors like environmental changes, cultural practices, diverse geographical distribution and over exploitation by pharmaceutical industry (Pourmorad et al., 2006). Plant includes herbs, shrubs, trees and climbers all have the medicinal value and each part are used in traditional system of medicine and drug development. About 15000 to 20000 variety of plant species have the medicinal value, among

them about 7000 to 8000 plant species are used as medicine by tribal communities (Joy et al., 1998). Many valuable medicinal species are becoming endangered due to over exploitation from wild (Rao et al., 2004). Hence, the study needs to do to conserve the medicinal plants as well as the medicinal datas about their uses should be recorded.

## Methodology

Odisha is known as a land for tribal community. Rairangpur situated in Mayurbhanj district is dominated with tribals. For them, forest is the only source for their livelihood. Rairangpur enjoys both the Moist Deciduous and Tropical Dry Deciduous forests (Mishra and Patel 2003).

## Data collection and exploration work

The survey works were carried out by standard technique of exploration and includes ethnobotanical survey in field, interviews with local people and data collection. Field trips were carried out to different resourceful area of Rairangpur (Figure 1). The ethnobotanical information on the wild medicinal trees were collected by questionnaires. The plants were identified by Dr. Sanjeet Kumar with the help of “Flora of Orissa” (Saxena and Brahmam, 1995) and “Botany of Bihar and Orissa” (Hains 1921-1925).



Figure 1: Study area

## Results and Discussion

From the present study, about 50 medicinal tree species (Figure 3, 3.1, 3.2, 3.3) are found belonging to 24 families. Among them, Fabaceae have a large number of species followed by Moraceae, Combretaceae and Caesalpiniaceae (Figure 2). The botanical name, family, common name, parts used, mode of use and medicinal uses are mentioned below (Table 1). Each trees have different medicinal values and different mode of uses. The parts like bark, leaves, roots, flowers, fruits, seeds etc. are used in the preparation of medicine for many ailments. There are different modes for the preparation of medicine i.e., decoction, juice, powder raw etc.

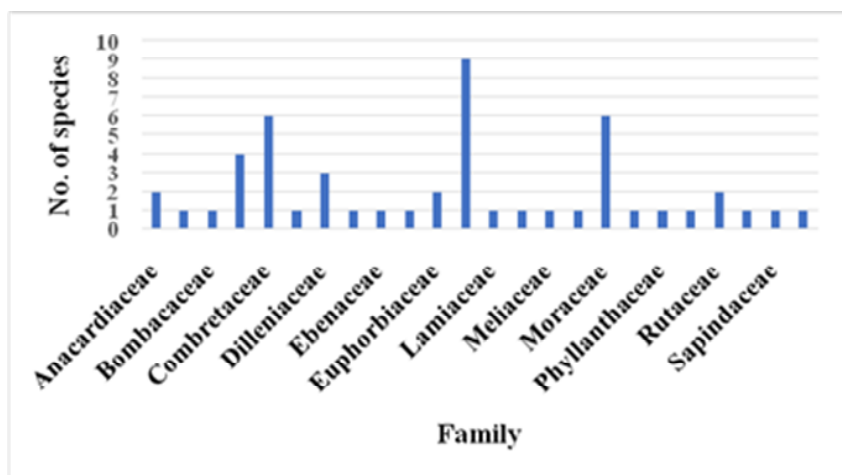
**Table 1:** Some medicinal trees of Rairangpur, Mayurbhanj, Odisha

Botanical name	Common name	Family	Plant part used	Mode of use	Medicinal uses
<i>Acacia auriculiformis</i>	Jaranasaka	Fabaceae	Root	Decoction	Aches and pain
<i>Aegle marmelos</i>	Bel	Rutaceae	Root	Dried	Earaches
<i>Alangium salvifolium</i>	Ankula	Cornaceae	Fruit	Juice	Eye diseases
<i>Albizia procera</i>	Dhalasiris	Fabaceae	Bark	Decoction	Rheumatics
<i>Alstonia scholaris</i>	Chhatiana	Apocynaceae	Leaves	Poultice	Skin diseases
<i>Anacardium occidentale</i>	Kaju	Anacardiaceae	Leaves/Bark	Infusion	Toothache and sore gums
<i>Anogeissus latifolia</i>	Dhaura	Combretaceae	Leaves	Juice	Snakebite
<i>Artocarpus heterophyllus</i>	Panasa	Moraceae	Root	Decoction	Skin diseases and asthma
<i>Azadirachta indica</i>	Neem	Meliaceae	Bark	Decoction	Haemorrhoid
<i>Bauhinia variegata</i>	Kanchana	Fabaceae	Flowers	Juice	Stomach disorder
<i>Bauhinia x blakeana</i>	-	Caesalpiniaceae	Bark	Decoction/Infusion	Oral disorder
<i>Bombax ceiba</i>	Simili	Bombacaceae	Young roots	Juice/Decoction	Cough and cholera
<i>Buchanania lanzan</i>	Chara	Anacardiaceae	Leaves	Paste	Skin diseases
<i>Butea monosperma</i>	Palasa	Fabaceae	Flowers	-	Liver disorder
<i>Cassia fistula</i>	Sunari	Caesalpiniaceae	Leaves/Bark	Paste	Skin diseases

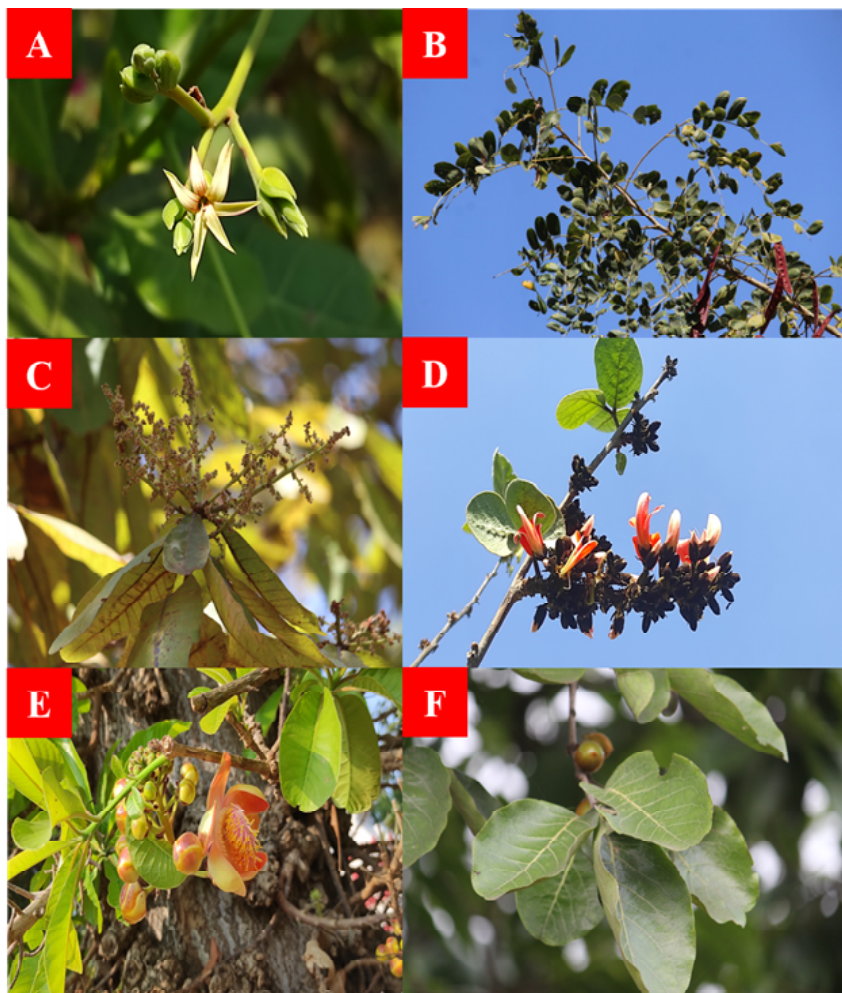
Botanical name	Common name	Family	Plant part used	Mode of use	Medicinal uses
<i>Cordia macleodii</i>	Ghanta	Ehretiaceae	Bark	Powder	Jaundice
<i>Couroupita guianensis</i>	Naga champa	Lecythidaceae	Pulp	-	Skin diseases of animal
<i>Dalbergia lanceolaria</i>	Chakundia	Fabaceae	Bark	Powder	Diarrhoea and leprosy
<i>Dalbergia sisso</i>	Sissoo	Fabaceae	Leaves/Bark	Powder	Skin diseases
<i>Delonix regia</i>	Krushna chuda	Caesalpiniaceae	Leaves	Decoction	Inflammations
<i>Dillenia aurea</i>	Bada rai	Dilleniaceae	Fruit	Juice	Abdominal disorder
<i>Dillenia indica</i>	Oou	Dilleniaceae	Bark	Fresh	Thrush
<i>Dillenia pentagyna</i>	Rai	Dilleniaceae	Leaves	Paste	Snakebite
<i>Diospyros melanoxylon</i>	Kendu	Ebenaceae	Flowers	Dried	Skin diseases and blood disorder
<i>Ficus benghalensis</i>	Bara	Moraceae	Roots	Decoction	Gonorrhoea
<i>Ficus benamina</i>	Kuji bara	Moraceae	Bark and leaves	Pounded	Rheumatic headache
<i>Ficus racemose</i>	Dimiri	Moraceae	Root	Chew	Tonsillitis
<i>Ficus semicordata</i>	Bhuindimiri	Moraceae	Root	Juice	Headache
<i>Ficus tinctoria</i>	Kasha kijhiri	Moraceae	Leaves	Juice	Dressing for broken bones
<i>Glochidion lanceolarium</i>	Leaf flower tree (E)	Phyllanthaceae	Plant	-	Dysentery
<i>Gmelina arborea</i>	Gambhari	Lamiaceae	Flower	Dried/ Juice	Leprosy and blood diseases
<i>Holoptelea integrifolia</i>	Charia	Ulmaceae	Bark and leaves	Poultice	Boils and inflammation.
<i>Leucaena leucocephala</i>	Keli kadamba	Mimosaceae	Root/Bark	Decoction	Abortifacient
<i>Limonia acidissima</i>	Kaitha	Rutaceae	Fruit	Fresh	Dysentery
<i>Madhuca longifolia</i>	Mahula	Sapataceae	Seed	Oil	Skin diseases
<i>Mallotus philippensis</i>	Sinduri	Euphorbiaceae	Bark and fruits	Powder	Skin diseases and ring worm
<i>Phyllanthus emblica</i>	Amla	Euphorbiaceae	Fruit	Dried/Fresh	Digestion
<i>Pongamia pinnata</i>	Karanja	Fabaceae	Leaves	Infusion	Rheumatics
<i>Pterocarpus marsupium</i>	Piasal	Fabaceae	Bark	Powder/ Decoction	Diarrhoea
<i>Saraca asoca</i>	Ashoka	Fabaceae	Seed	-	Urinary disorder



Botanical name	Common name	Family	Plant part used	Mode of use	Medicinal uses
<i>Schleichera oleosa</i>	Kusum	Sapindaceae	Seed	Powder	Wounds of cattle
<i>Senna siamea</i>	Simatangedu	Caesalpiaceae	Bark	Decoction	Scabies
<i>Shorea robusta</i>	Sal	Dipterocarpaceae	Leaves	Juice	Dysentery
<i>Syzygium cumuni</i>	Jamun	Myrtaceae	Leaves	Infusion	Diabetes and diarrhoea
<i>Terminalia alata</i>	Asana	Combretaceae	Bark	Juice	Cuts and wounds
<i>Terminalia arjuna</i>	Arjuna	Combretaceae	Leaves	Juice	Earaches
<i>Terminalia bellirica</i>	Bahada	Combretaceae	Fruit	Powder	Constipation
<i>Terminalia catappa</i>	Desi badam	Combretaceae	Bark	Infusion	Stomach ache
<i>Terminalia chebula</i>	Harida	Combretaceae	Fruit	Powder	Constipation and diarrhoea
<i>Wendlandia heynei</i>	Tilo	Rubiaceae	Bark	Powder	Skin diseases

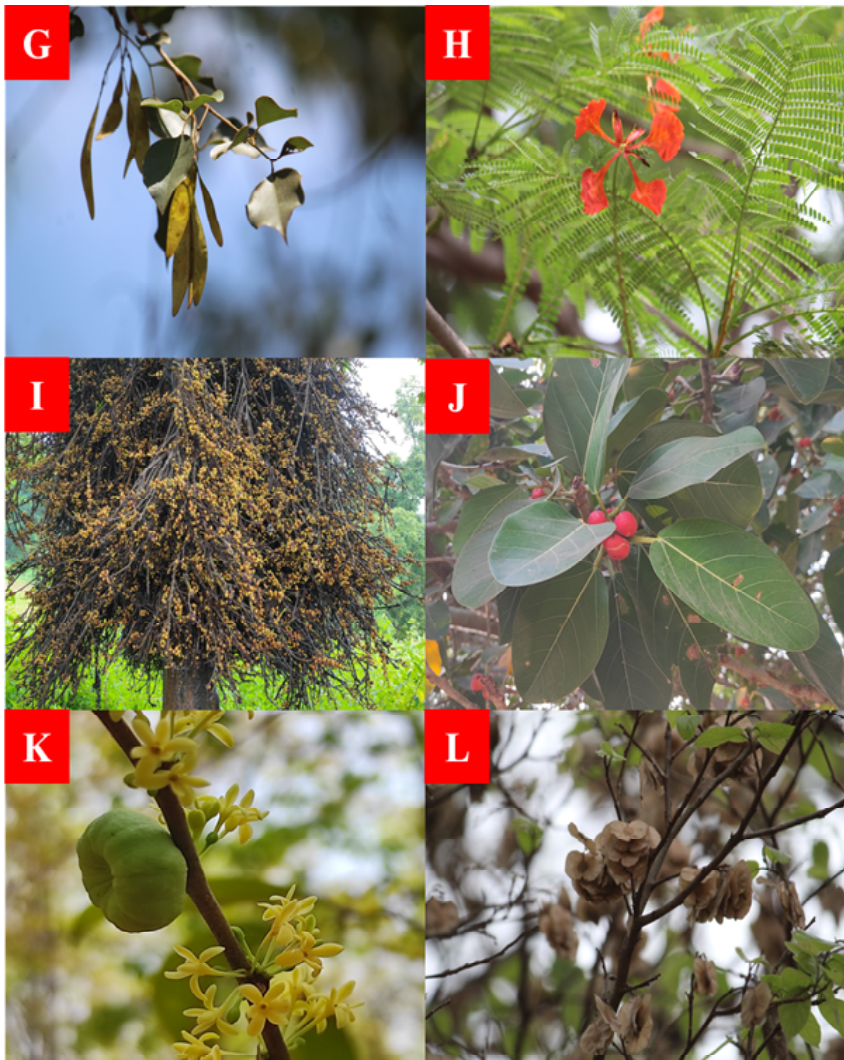


**Figure 2:** Total number of species present in the corresponding family



**Figure 3:** Some important trees of Rairangpur, Mayurbhanj, Odisha

- A) *Anacardium occidentale*, B) *Albizia procera*, C) *Buchanania lanzan*,  
D) *Butea monosperma*, E) *Couroupita guianensis*,  
F) *Diospyros melanoxylon*



**Figure 3.1:** Some important trees of Rairangpur, Mayurbhanj, Odisha

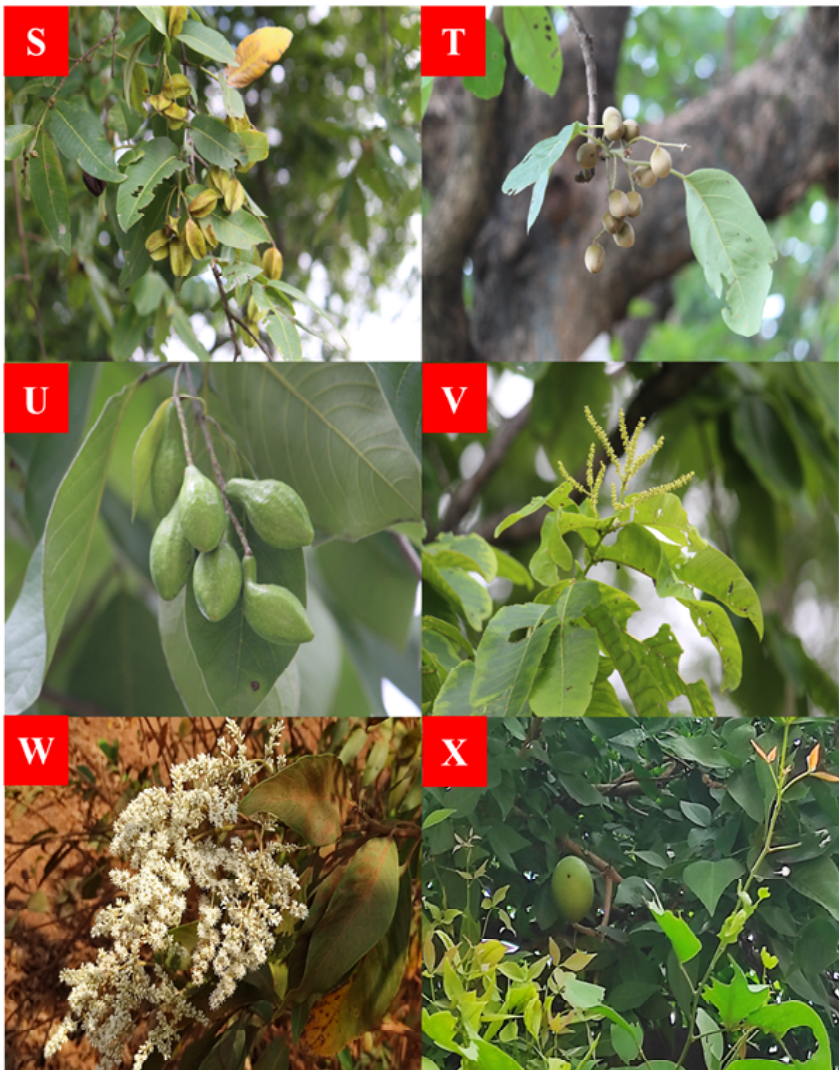
- G) *Dalbergia sissoo*, H) *Delonix regia*, I) *Ficus semicordata*,  
J) *Ficus benghalensis*, K) *Glochidion lanceolarium*,  
L) *Holoptelea integrifolia*





**Figure 3.2:** Some important trees of Rairangpur, Mayurbhanj, Odisha

M) *Mallotus philippensis*, N) *Madhuca longifolia*, O) *Pterocarpus marsupium*, P) *Pongamia pinata*, Q) *Syzygium cumini*,  
R) *Schleichera oleosa*



**Figure 3.3:** Some important trees of Rairangpur, Mayurbhanj, Odisha

- S) *Terminalia arjuna*, T) *Terminalia bellerica*, U) *Terminalia chebula*, V)  
Terminalia alata, W) *Wendlandia heynei*, X) *Aegle marmelos*

## **Conclusion**

Medicinal trees are some of our oldest medicines. They are used by millions of people in the treatment for their real and perceived beneficial effects. The present study concluded that the local people of Rairangpur has a fairly extensive and detailed knowledge regarding the medicinal trees and their uses. They have a wide range of knowledge on the use of trees for various purposes. They get the knowledge from the ancestor or Vedas. Now-a-days due to the chemical drug, people give less interest on the plant medicines. Hence, we need to give more attention to conserve and record the medicinal values of the plants. This study will help common people maintain their health (the objective of SDG3) at low cost.

## **Acknowledgement**

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# A note on *Streptococcus* *pyogenes* and plants used against its pathogenic action

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## Abstract

*Streptococcus pyogenes* is gram positive bacteria and responsible for skin infections and other diseases. There are numbers of antibiotics are available but plant based formulation has less or no side effects. Therefore, the present study has designed to gather the information about *S. pyogenes* and plants used against its negative action. The results highlights the importance of medicinal plants against pathogenic bacteria.

**Keywords:** Bacterial infections, Plants, Microbial pathogenic mechanisms

## Introduction

The story started when I was child and suffered from skin infections. I asked to my teachers, what happened to my skin? They replied that may be due to bacterial infections. Again I asked what bacteria are? Got answer that a tiny organism not abeles to see by naked eyes. From that

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time to till now, when I am doing my M.Sc. in Microbiology, I know now what are bacteria and their harmful and useful applications. In this chapter, we are going to learn about bacteria, their classifications, their characteristics, and mainly we focused on specific gram positive bacteria that are *Streptococcus pyogenes*.

In the 1970s, Carl Woese made clear that the prokaryote contains two major groups of organisms, called Bacteria (Eubacteria), and Archaea (ancient) evolved from a common ancestor called Progenote. First bacteria are discovered in rain drops and tartar of teeth by Antonie Van Leeuwenhoek (1676) and named as “streaks and threads” or “animalcules”. Another scientist named Linnaeus (1758) named these as Vermes. Christian Gottfried Ehrenberg (1828) first coined the term “Bacterium”. Louis Pasteur (1859) first discovered that, bacteria were the cause of some disease and this fact was called “germ theory of disease”. Ferdinand Chon (1870) was the first to classify bacteria on their morphological basis and said to be a founder of bacteriology. Bacteria are the plural form of “Bacterium” and were the first forms of life on earth about 4 billion years ago. Bacteria are the simplest microscopic, unicellular prokaryotes, which don't possess a true nucleus and placed under kingdom Prokaryota by scientist Bergey (1974). He published this classification in the Bergey's Manual of Determinative Bacteriology book. Each bacterial cell consists of 1-2  $\mu\text{m}$  in diameter, 0.2  $\mu\text{m}$  in width and 1-10  $\mu\text{m}$  in length (1  $\mu\text{m}$  =  $10^{-4}$  mm). Largest bacterium is *Thiomargarita namibiensis* (750  $\mu\text{m}$ ) in length and smallest one is *Dialister pneumosintes* (0.5-0.3  $\mu\text{m}$ ).  $10^{12}$  ml of volume is occupied by 1000 bacteria and these are invisible in naked eyes. The shape and size of the bacteria varies called morphologies. Most bacterial species show different size such are cocci (spherical) e.g. *Streptococcus*, Bacilli (rod shape) e.g. *Bacillus*, vibrio (comma shape) e.g. *vibrio cholera*, spirilla (rigid spiral form) e.g. *S. volutans*, spirochete (flexus spiral forms) e.g. *Triponema*, mycelia (branched) e.g. *actinomyces*, *streptomyses*. Pleomorphic (variable shape and size) e.g. *Cocco bacillus*, stalked shape e.g. *Gallionella*, *Strepto bacillus* (in chain) e.g. *B. anthraxis*, *Staphylococcus* (grape like) e.g. *Staphylococcus aureus*.

The term *Streptococcus* was given by Albert T. Billroth. Some of them are essential in industrial and dairy processes as pollution indicator. Various

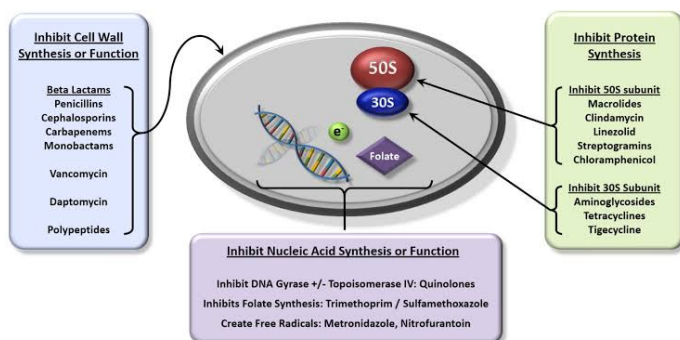
*Streptococci* are ecologically important as part of the normal micro flora of animals and humans. Some of them cause diseases whose impact ranges from sub-acute to acute [Maria JP, 1996]. After development of Molecular typing technique, *Streptococci* were specified into four primary divisions:

- (1) Pyogenic
- (2) Viridians
- (3) Lactic
- (4) Enterococci

The pyogenic division contains animals and human infection associated species like GAS [Mark and Shiranee 2015].

## Mechanism of Action of Antibiotics

Antibiotics functions have been associated with the break on double stranded DNA on treatment with DNA gyrase inhibitors [Drlica et al., 2008], with the arrest of DNA dependent RNA synthesis on treatment with rifamycins [Floss and Yu, 2005], on treatment with cell wall synthesis inhibitors leads to cell envelope damage and loss of structural integrity [Tomasz 1979], and protein mistranslation following treatment with protein synthesis inhibitors [Mobashery, 2003; Kohanski et al., 2010].



**Figure 1: Mechanism of actions**

## **Plants Used Against Streptococcus Pyogenes**

*S. pyogenes* is the major causative organism for upper respiratory tract infections (URTIs) mainly bacterial pharyngitis. Increase in antibiotic use has resulted in antibiotic resistance of *S. pyogenes*. Hence, search for the alternative treatment dealing with URTIs caused by *S. pyogenes* is necessary. The use of medicinal plants may substitute antibiotic uses for URTIs. Herbal medicines are relative safer than synthetic drug and relative offer great therapeutic benefits [Surasak et al., 2013].

There are a number of Thai medicinal plants are used as antimicrobial activity against many pathogens since from ancient era. Here are several reports on limited number of plants used against *S. pyogenes* (Table 1).

Table 1: Antimicrobial activity of selected Thai medicinal plants against *Streptococcus pyogenes* NPRC 101 [Surasaket al., 2013]

<b>Botanical species</b>	<b>Family</b>	<b>Plant part</b>
<i>Acacia catechu</i>	Fabaceae	Core
<i>Aeglema melos</i>	Rutaceae	Fruit
<i>Alstonia scholaris</i>	Apocynaceae	Wood
<i>Ardisia colorata</i>	Myrsinaceae	Fruit
<i>Asclepias curassavica</i>	Asclepiadaceae	Wood
<i>Boesenbergia pandurata</i>	Zingiberaceae	Rhizome
<i>Cassia alata</i>	Fabaceae	Leaf
<i>Centella asiatica</i>	Apiaceae	Leaf
<i>Cleome gyanandra</i>	Capparaceae	Whole plant
<i>Coriandrum sataivum</i>	Apuaceae	Fruit
<i>Curcuma zedoaria</i>	Zingiberaceae	Rhizome
<i>Derris scandens.</i>	Leguminosae	Stem
<i>Dracaena loureiroi</i>	Agavaceae	Core
<i>Dryopteris syrmatica</i>	Polypodiaceae	Wood
<i>Eleutherine americana</i>	Iridaceae	Bulb
<i>Gymnopetalum cochinchinensis</i>	Cucurbitaceae	Fruit
<i>Holarrhena antidysenterica</i>	Apocyanaceae	Bark
<i>Impatiens balsamina</i>	Balsaminaceae	Leaf
<i>Manilkara achras</i>	Sapotaceae	Fruit

<b>Botanical species</b>	<b>Family</b>	<b>Plant part</b>
<i>Millingtonia hortensis</i>	Bgnoniaceae	Flower
<i>Mimosa pudica</i>	Fabaceae	Whole plant
<i>Mitragyna speciosa</i>	Rubiaceae	Leaf
<i>Momordica charantia</i>	Cucurbitaceae	Vine
<i>Morinda citrifolia</i>	Rubiaceae	Fruit
<i>Murdannia loriformis</i>	Commelinaceae	Whole plant
<i>Oroxylum indicum</i>	Bignoniaceae	Bark
<i>Phyllanthus amarus</i>	Euphorbiaceae	Whole plant
<i>Piper chaba</i>	Piperaceae	Fruit
<i>Piper nigrum</i>	Piperaceae	Fruit
<i>Piper sarmentosum</i>	Piperaceae	
<i>Pluchea indica</i>	Asteraceae	Leaf
<i>Psidium guajava</i>	Myrtaceae	Leaf
<i>Quercus nfectoria</i>	Fagaceae	Nut gall
<i>Quisqualis indica</i>	Combretaceae	Flower
<i>Sandoricum indicum</i>	Maliaceae	Root
<i>Tamarindus indica</i>	Fabaceae	Leaf
<i>Terminalia bellirica</i>	Combretaceae	Fruit
<i>Terminalia chebula</i>	Combretaceae	Fruit
<i>Terminalia sp.</i>	Combretaceae	Fruit
<i>Theobroma cacao</i>	Sterculiaceae	Pericarp

## Conclusion

The present study concluded that the medicinal plants are a good source and agents against the microbial infections. They have less or no side effect actions which lead to great and easy acceptance for all.

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# Some medicinal Climbers of Rairangpur, Mayurbhanj, Odisha

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## Abstract

Odisha is a state rich in floral diversity. There are many small town and villages. Rairangpur is a small town in Odisha which have a vast areas of forest lands. Rairangpur enjoys both the Moist Deciduous and Tropical Dry Deciduous forests. The area is dominated by tribal communities. Forest is the only source for their livelihood. They use many medicinal plants as a primary source for their health-care. Hence, more study needs to do to know the medicinal values. The present study is carried out to collect the data on the medicinal climbers of Rairangpur. The study reveals that there are about 41 climber species belongs to 21 families. Each species has different medicinal values and different mode of use. The data was collected and recorded for future use.

**Key Words:** Climbers, Medicinal Uses, Tribal community, Forest, Healthcare

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## **Introduction**

Use of plants to cure human ailments is very old like human civilization. There are two systems of medicine i.e., Indian Traditional System of Medicine like Ayurveda, Unani and Siddha and the Chinese Traditional System of Medicine which employ a great variety of plants in their curative and preventive preparation (Patel 2014). The plants are also used to develop drugs to cure those diseases which have not satisfactory chemical drugs (Kumar et al., 2005). Almost all types of plants have been used for medicinal purposes including herb, shrub, trees, climbers and creepers. Also, there are different parts of plants like leaves, shoots, roots, stems, barks etc. are used as traditional medicine. The Traditional System of Medicine uses the plant material according to its own principle (Kalam and Ahmad 2016).

Climbers are one of the most interesting groups but a much-neglected group of plants but the climbers contribute a charm to the landscapes in which they climb over trees or rocks (Jangid and Sharma 2011). Climbers are the plants which germinate on ground but grow adhering with other plants (Agarwal 2013; Narayan et al., 2008; Schnitzer and Bongers 2002). Climbers are also an important source of ethnobotanical utilization and used for curing various ailments by local people. Hence, the utilization and study of climbers for traditional knowledge is a very important component and are valuable mainly due to their medicinal attributes (Rai and Kumar 2016). Herbal medicines were the ancient healthcare system that is known to mankind. About 2,50,000 species of higher plants are known to exist on planet earth and about 35,000 species have been used in the Traditional System of Medicine (Yirga et al., 2011). People of developed and developing countries specially in rural areas rely on medicinal plants as a primary source of health care (Ali et al., 2018; Ajaib et al., 2012). Mostly, climbers are used to treat common ailments like diarrhoea, constipation, hypertension, dysentery, piles, bronchial asthma and fever (Qureshi et al., 2010). It is necessary to document the plant material used as medicine to treat an ailment keeping in mind SDG 3 defined by the United Nations.

### Methodology

The ethnobotanical information on the wild medicinal climbers were collected by questionnaires with local people in study areas (Figure 1). Information on diversity of species of climbers used as medicine were gathered and the scientific and local name were assigned immediately on the spot (Hains 1921-1925; Saxena and Brahmam, 1995).



Figure 1: Study area

### Results

The present study results 41 climber species belong to 21 families (Figure 3 & 3.1). Among them Apocynaceae, Dioscoreaceae and Convolvulaceae occupies the highest number of species (Figure 2). The botanical name with accepted citation, family, common name, parts used, mode of use and medicinal uses are mentioned below (Table 1). Different parts are used to cure different ailments in different mode. It is found that tribal people of Rairangpur used the climbers to treat common diseases like cough, fever, inflammation etc.

Botanical name	Common name	Parts used	Mode of use	Medicinal uses
<i>Abrus precatorius</i> L.	Kaincha (O)	Seed	Powder	It is given to cattle to treat liver disorder.
<i>Adenanthera pavonina</i> L.	Raktakaincha (O)	Leaves	Decoction	It is used to treat rheumatism and gout.
<i>Aganosma cymosa</i> (Roxb.) G. Don	Madiki	Whole plant	Decoction	It is used to treat bronchitis.
<i>Aganosma dichotoma</i> K. Schum.	Malati (O)	Flowers/Leaves	Powder	It is used to treat bronchitis and eye trouble.
<i>Aganosma heynei</i> (Spreng.) ined.	Bana malati (O)	Flower	Paste	It is used to treat eye disorder.
<i>Ampelocissus latifolia</i> (Roxb) Planch.	Kanjianai	Leaves	Paste	It is used to treat bone fracture.
<i>Aristolochia indica</i> L.	Hansalata (O)	Leaves	Juice	It is used to treat snake bite.
<i>Asparagus racemosus</i> Willd.	Satabari (O)	Root/Whole plants	Tonic	It is used to treat rheumatics.
<i>Bauhinia vahlii</i> Wight & Arn.	Siali lata (O)	Seed	Raw	Consume in poor appetite
<i>Cardiospermum halicacabum</i> L.	Futfutika (O)	Leaves	Poultice	It is used to treat rheumatism.
<i>Cayratia pedata</i> (Lam) Gagnep.	Panikoda (O)	Whole plant	Juice	It is used as cough and asthma.
<i>Celastrus paniculatus</i> Willd.	Pengu	Root	Decoction	It is used to treat malaria.
<i>Coccinia grandis</i> (L.) Voigt	Bana kunduri (O)	Leaves	Paste	It is applied externally to treat ringworm.
<i>Combretum indicum</i> (L.) De Filippis	Quisqualis	Leaves	Decoction	It is used as vermifuge and to treat rheumatism.
<i>Cryptolepis buchanani</i> (Burm.f.) M. R. Almeida	Dudhi nai	Stem	Latex	It is used to treat wounds.
<i>Dioscorea alata</i> L.	Khambaalu (O)	Tuber	Decoction	It is used to treat sore throat.
<i>Dioscorea bulbifera</i> L.	Pita kanda (O)	Tuber	Decoction	It is used to treat acidity.
<i>Dioscorea dumetorum</i> (Kunth) Pax	Cluster yam (E)	Tuber	Powder	It is used to treat diabetics.
<i>Dioscorea oppositifolia</i> L.	Panialu(O)	Tuber	Powder	It is mixed with cow urine to treat scorpion bite.
<i>Dioscorea pentaphylla</i> L.	Mundi alu (O)	Tuber	Boil	It is used to treat diabetics
<i>Diplocyclos palmatus</i> (L.) C. Jeffrey	Sibalingi (O)	Fruit/Leaves	Paste	It is used to treat stomach pain.
<i>Gloriosa superba</i> L.	Agnisikha	Root	Paste	It is used to treat hairfall.
<i>Gymnema sylvestre</i> (Retz.) R. Br. ex Sm.	Gudmari (O)	Root	Juice	It is used as an antidote against snake bite.
<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	Ananta muli(O)	Root	Paste	It is used to treat inflammation.
<i>Ichnocarpus frutescens</i>	Shyamalata	Whole plant	Decoction	It is used to treat cough.

Botanical name	Common name	Parts used	Mode of use	Medicinal uses
<i>Ipomoea marginata</i> (Desr.) Verdc.	Lakshman	Leaves	Paste	It is used to treat measles.
<i>Jasminum auriculatum</i> Vahl	Malati	Leaves	Decoction	It is used to treat mouth ulcer.
<i>Luffa cylindrica</i> (L.) M. Roem.	Bana janhi (O)	Root	Decoction	It is used to treat constipation.
<i>Merremia aemarginata</i> (Burm.f.) Hallier f.	Musakani (O)	Aerial parts	Juice	It is used to treat ulcer and sores.
<i>Merremia hederacea</i> (Burm.f.) Hallier f.	Hemali (O)	Leaves	Poultice	It is mixed with broken rice and turmeric used to treat crack on hands and legs.
<i>Merremia tridentata</i> (L.) Hallier f.	Pasaruni (O)	Whole plants	Decoction	It is taken to get relief from various ophthalmias.
<i>Merremia vitifolia</i> (Burm.f.) Hallier f.	Navli (O)	Root	Raw	Its is taken to treat stomach-ache.
<i>Mikania micrantha</i> Kunth	Lahara (O)	Stem/Leaves	Decoction	It is used to treat malaria and eczema.
<i>Passiflora foetida</i> L.	Gandha tamal (O)	Leaves	Infusion	It is used to treat wounds.
<i>Pergularia daemia</i> (Forssk.) Chiov.	Uturidi (O)	Root	Infusion	It is taken to treat stomach-ache.
<i>Piper longum</i> L.	Pipali (O)	Fruits	Decoction	It is used to treat asthma and cold.
<i>Solena amplexicaulis</i> (Lam.) Gandhi	Bana kunduri (O)	Leaves	Paste	It is used to treat inflammation.
<i>Stephania japonica</i> (Thunb.) Miers.	Akanabindhi (O)	Root	Paste	It is used to treat itches.
<i>Teramnus labialis</i> (L.f.) Spreng.	Mashani (O)	Whole plant	Decoction/Infusion	It is used to treat nerve disorder.
<i>Thunbergia grandiflora</i> (Roxb. ex Rottl.) Roxb.	Chhotoganthi (O)	Leaves	Juice	It is used to treat snake-bite.
<i>Tinospora cordifolia</i> (Willd.) Mier.	Guduchi (O)	Whole plant	Decoction/Juice	It is used to treat rheumatics.

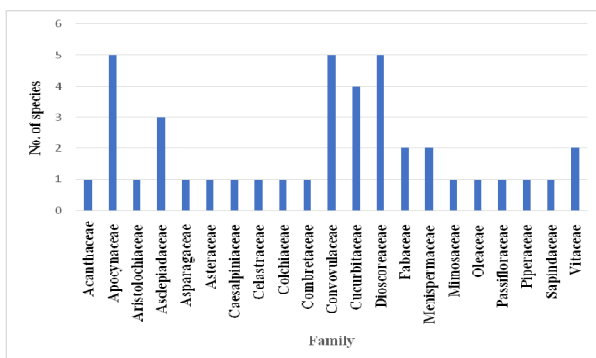
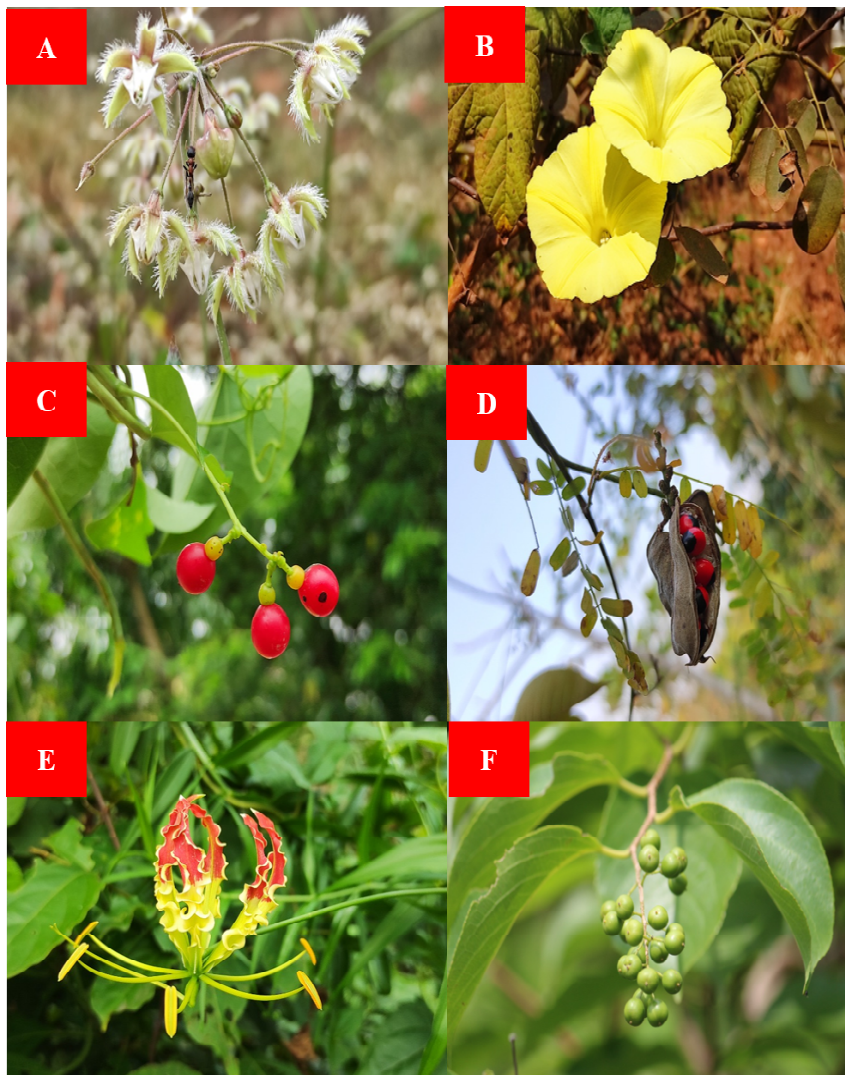
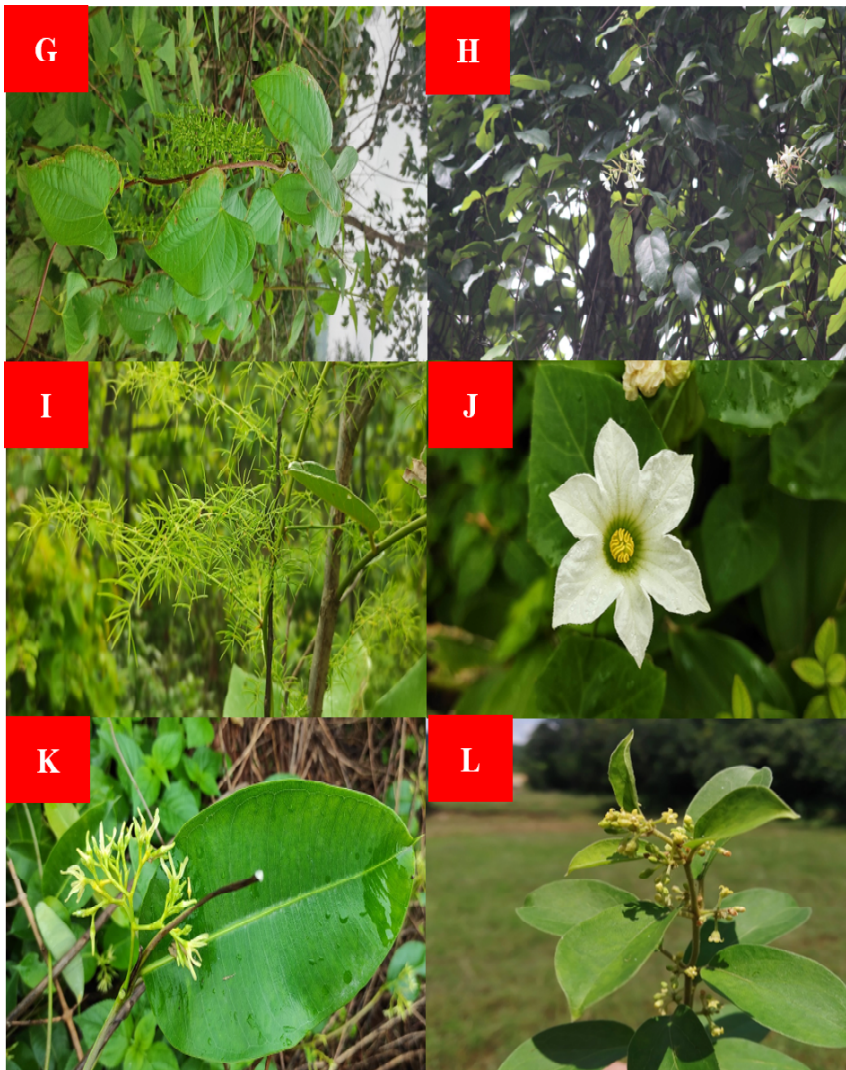


Figure 2: Total number of species present in the corresponding family



**Figure 3: Some important medicinal climbers**

A) *Pergularia darmlia*, B) *Ipomoea vitifolia*, C) *Tinospora cordifolia*, D) *Abrus precatorius*, E) *Gloriosa superba*, F) *Celastrus paniculatus*



**Figure 3.1: Some important medicinal climbers**

- G) *Dioscorea bulbifera*, H) *Aganosma caryophylla*, I) *Asparagus racemosus*, J) *Coccinia grandis*, K) *Cryptolepis buchanani*,  
L) *Gymnema sylvestres*



## **Conclusion**

Climbers play an important role as well as other plants. They are morphologically different from the other plants. They also possess some medicinal values and can be used to treat many ailments. From the above study it is found that most of the climbers are used to treat ailments like fever, cold, inflammation etc. It has less harm than the chemical drug for which it gets a special attention for health care. Hence, more study needs to be done to know the medicinal values and more data should be collected for future use which will help in drug development.

## **Acknowledgement**

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# **Some important medicinal herbs of Rairangpur, Mayurbhanj, Odisha**

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## **Abstract**

From the ancient time, most of the people depends on the plant product as their primary source of. Hence, the study is carried to know the medicinal properties of some herbs. Most of the tribal community of Rairangpur depend on wild food plant for their health care. The main aim of this survey is to identify the medicinal herbs and record its medicinal values by discussing with people and by the literature survey. About 50 herb species are found belonging from 29 family among them family Asteraceae occupies the largest number of species followed by Poaceae the Linderniaceae and Acanthaceae. Mostly, people use leaves of the herbs followed by whole plant and the roots. Hence, people should be aware to conserve medicinal plants and the medicinal values of each medicinal plant needs to record for future study.

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## **Introduction**

Some plant derivatives continued to provide new and important leads in the drug delivery process (Balunas and Kinghorn 2005). According to people, plants are the gift from God which provides food, medicine and shelter (Ahvazi et al., 2012). From the beginning of human civilization people depend on the plant as a primary source to cure many ailments (Bukhah et al., 2007). Medicinal plants are mainly considered as a bio sources of chemical entities, modern medicine and traditional medicines for drug development (Ncube et al., 2008). There are two main living tradition exist i.e., Traditional Indian Medicine (Ayurveda) and the Traditional Chinese Medicine. Both have been knit together to contribute to diverse knowledge on therapeutic plants and they have also contributed with a long list of plants and phytomedicine used throughout the world. In both traditional system medicines were prepared as herbal product in various formulation like powder, poultices and juice (Blair et al., 2015). The traditional knowledge of using plant medicine spread from one generation to next verbally by which the indigenous knowledge on medicinal plant is decreasing day by day (Bhatia et al., 2014). In this world about 80% people depend on the plant product for healthcare. Every part of herbs, shrubs and trees are used in the traditional medicine. Herbs are the staging a comeback. The herbal products symbolise safety in contrast to the synthetic that are regarded as unsafe to human and environment. More than 30% of the plant species used as medicinal purposes. India is one of the twelve biodiversity centres in the world and there are about 45000 types of plant species. About 15000 to 20000 variety of plant species have the medicinal value, among them about 7000 to 8000 plant species are used as medicine by tribal communities (Joy et al., 1998). Herbs refers to the non woody plants or any parts of plant like fruits, flowers and leaves. The plants are used as food as well as medicine. in the Indian traditional system of medicine about 8000 herbal remedies have been synthesized. People of ancient time as well as the tribal communities believes that herbs are the only solution to cure many health problems. Mostly, herbs are used to treat common ailments like diarrhoea, constipation, hypertension, dysentery, piles, bronchial asthma and fever

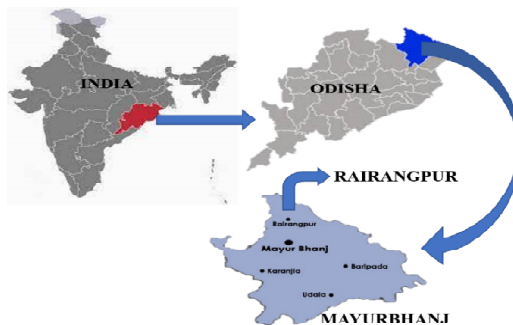
(Qureshi et al., 2010). Hence, it is necessary to document the plant material used as medicine to treat an ailment.

## Methodology

Odisha is a state having tremendous floral diversity. There are many small town and villages. Rairangpur is a small town in Odisha which have a vast areas of forest lands. Rairangpur enjoys both the Moist Deciduous and Tropical Dry Deciduous forests. The area is dominated by tribal communities. Forest is the only source for their livelihood (Mishra and Patel 2003).

## Data collection and exploration

The survey works were carried out by standard technique of exploration and includes ethnobotanical survey in field, interviews with local people and data collection. Regular field trips were carried out to different resourceful area of Rairangpur. The ethnobotanical information on the wild medicinal herbs were collected by questionnaires with local people. Information on diversity of species of herbs used as medicine were gathered and the scientific and local name were assigned immediately on the spot. The detailed information on habitat of plants, their botanical names, common name and medicinal uses were recorded. By different quarries with local people the medicinal uses of plants were cross-checked and the specimens were identified with the help of “Flora of Orissa” (Saxena and Brahmam, 1995) and “Botany of Bihar and Orissa” (Hains 1921-1925).



**Figure 1:** Survey area

## Results and Discussion

From the above study, about 50 species are found belonging from 29 family (Figure 4 & 4.1). Among all, family Asteraceae (10) occupies the highest number followed by Poaceae (5) then Lindernaceae (4) and Acanthaceae (4) (Figure 2). The botanical name with accepted citation, family, common name, parts used and medicinal uses are mentioned below (Table 1). Different parts are used. People of Rairangpur mostly use leaves of a plant for medicine followed by whole plant and roots (Figure 3).

**Table 1: List of medicinal plants**

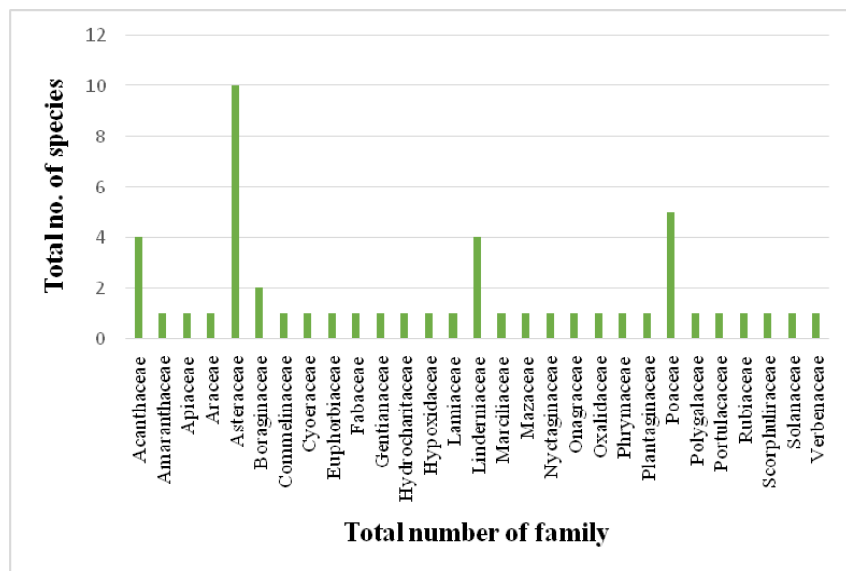
Botanical names	Family	Common name	Parts used	Medicinal used
<i>Acmella paniculata</i> (Wall. ex DC.) R. K. Jansen	Asteraceae	Toy chilli plant (E)	Flower	It is used to treat toothache.
<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	Pokasungha (O), Billygoat-weed (E)	Whole plant	It is used to treat cuts and bruises
<i>Andrographis paniculata</i> (Burm.f.) Nees	Acanthaceae	Bhuin neem (O), Bitterweed (E)	Whole plant	It is effective against snake bite and used as a tonic for fever and itchy skin.
<i>Bacopa monnieri</i> (L.) Wettst.	Scrophulariaceae	Brahmi (O, H), Bacopa (E)	Whole plant	It is used to treat nervous system disorder, indigestion and ulcer.
<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Pokasungha (O), Lettuce-leaf Blumea (E)	Flower	Decoction of fresh flower is taken to treat bronchitis.
<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Atikapodi (O), Spreading hogweed (E)	Leaves/Root	Leaf decoction is used to treat jaundice. Root decoction is used to treat dysentery.
<i>Caesulia axillaris</i> Roxb.	Asteraceae	Pink node flower (E)	Whole plant	Plant extract is used to treat malaria.
<i>Canscora diffusa</i> (Vahl) R.Br. ex Roem. &Schult.	Gentianaceae	Bururia (O)	Whole plant	It is used to treat paralysis.
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Thalkudi (O), Spadeleaf (E)	Whole plant	It is used internally in the treatment of memory enhancer and externally to treat wounds and minor burn.

Botanical names	Family	Common name	Parts used	Medicinal used
<i>Chloris barbata</i> Sw.	Poaceae	Swollen finger grass (E)	Whole plant	It is used to treat skin disorder and rheumatics.
<i>Coldenia procumbens</i> L.	Boraginaceae	Mohini buto (O), Creeping Coldenia (E)	Leaves	It is used rheumatic pain and leucorrhoea.
<i>Colocasia esculenta</i> (L.) Schott	Araceae	Saru (O)	Leaves	Plant is used to treat wound.
<i>Curculigo orchioides</i> Gaertn	Hypoxidaceae	Talamuli (O), Golden eye-grass (E)	Tuber	Tuber paste is used against leucorrhoea and snake bite
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Duba (O),	Whole plant	Whole plant is used to treat dysentery and hypertension.
<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Bhringaraj (O, H), False daisy (E)	Leaves/Whole plant	It is used to treat uterine and haemorrhage.
<i>Euphorbia thymifolia</i> L.	Euphorbiaceae	Kalijati (O)	Leaves	It is used as blood purifier and treat ulcer.
<i>Heliotropium ovalifolium</i> Forssk	Boraginaceae	Hatisundha (O), Grey Leaf Helitrope (E)	Whole plant	It is used as poultice to treat sever pain.
<i>Hemigraphis latebrosa</i> (Roth) Nees	Acanthaceae	Barengphul (O), Shade Loving Hemigraphis (E)	Leaves/Root	It is used against malaria
<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Ganga tulsi (O), Wild spikenard (E)	Leaves/Root	It is used to treat inflammations and root decoction is used as appetizer.
<i>Imperata cylindrica</i> (L.) Raeusch	Poaceae	Cogon grass (E)	Whole part	Decoction is used to treat fecer and urinary tract infections.
<i>Knoxia sumatrensis</i> (Retz.) DC.	Rubiaceae	Sumatra Knoxia (E)	Leaves	Leaves are grounded into paste and used to treat wounds.
<i>Lathyrus sativus</i> (L.)	Fabaceae	Grass pea (E)	Leaves	It is used to treat malaria.
<i>Lindernia anagallis</i> (Burm.f.) Pennell	Linderniaceae	Pimpernel lindernia (E)	Leaves	leaf decoction is given after child birth.
<i>Lindernia crustacea</i> (L.) F. Muell.	Linderniaceae	Malaysian false pimpernel (E)	Leaves	It is used to treat boils and itches.
<i>Lindernia dubia</i> (L.) Pennell	Linderniaceae	Moist bank pimpernel (E)	Leaves	It is used to treat dysentery.

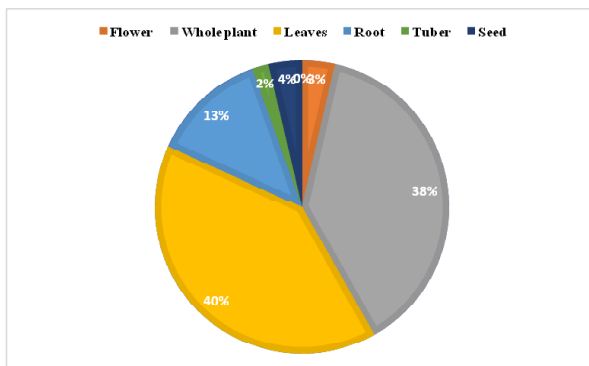
Botanical names	Family	Common name	Parts used	Medicinal used
<i>Lindernia rotundifolia</i> (L.) Alston	Linderniaceae	Baby's tear (E)	Leaves	Leaf paste is used to treat boils.
<i>Ludwigia adscendens</i> (L.) H.Hara	Onagraceae	Jagal (O)	Aerial part	Decoction of the aerial part is used to treat dysentery and fever.
<i>Marsilea minuta</i> (L.)	Marciliaceae	Sunsunia (O)	Leaves	Leaves are used to treat indigestion.
<i>Mazus pumilus</i> (Burm.f.) Steenis	Mazaceae	Malatijhaar (O)	Whole plant	It is used to treat typhoid.
<i>Mecardonia procumbens</i> (Mill.) Small	Plantaginaceae	Makardana (O)	Leaves	Plant is used to treat wounds.
<i>Mimulus strictus</i> Benth.	Phrymaceae	Erect monkey flower (E)	Whole plant	It is used to treat memory power.
<i>Murdannia nudiflora</i> (L.) Brenan	Commelinaceae	Dove weed (E)	Whole plant/Root	It is used to treat asthma and leprosy.
<i>Nelsonia canescens</i> (Lam.) Spreng	Acanthaceae	Blue pussy leaf (E)	Leaves	It is used to treat fever.
<i>Ottelia alismoides</i> (L.) Pers.	Hydrocharitaceae	Panikunduri (O)	Whole plant	It is used to treat asthma and dysentery.
<i>Oxalis corniculata</i> L.	Oxalidaceae	Ambiliti (O)	Whole plant	It is used to treat liver and digestive problems.
<i>Pennisetum pedicellatum</i> Trin.	Poaceae	Desho grass (E)	Leaves/Stem	It is used to treat wounds and parasitic infection.
<i>Pentanema indicum</i> (L.) Ling	Asteraceae	Sonkadi (O)	Root	It is used to treat fever.
<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	Jalapipali (O)	Whole plant	Plant paste is used to treat joint pains.
<i>Polygala arvensis</i> Willd	Polygalaceae	Gaighura (O)	Leaves	It is used to treat inflammation.
<i>Portulaca oleracea</i> L.	Portulacaceae	Badabalbalua (O)	Leaves	It is used to treat skin diseases and earaches.
<i>Rotala rotundifolia</i> (Buch. -Ham. ex Roxb.) Koehne	Lythraceae	Panilatkana (O)	Whole plant	Plant is used to treat gonorrhoea and piles.
<i>Schoenoplectiella articulata</i> (L.) Lye	Cyperaceae	-	Whole plant	It is used to treat body-ache, diarrhoea and fever.
<i>Solanum virginianum</i> L.	Solanaceae	Bhejibaigana (O)	Seed	It is used in the treatment of asthma.

Botanical names	Family	Common name	Parts used	Medicinal used
<i>Sphaeranthus indicus</i> (L.)	Asteraceae	Bhuinkadamba (O), East Indian globe thistle (E)	Whole plant/ Root	Root decoction is used to treat diabetes and whole plant paste is used to treat skin diseases.
<i>Strobilanthes scaber</i> Nees	Acanthaceae	Khakusa (O)	Leaves	Leaf juice is used to treat stomach pain.
<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Hare jhaar (O)	Leaves	It is used to treat headache and inflammation.
<i>Themeda triandra</i> Forssak.	Poaceae	Kangaroo grass (E)	Root	Decoction is used to treat dysmenorrhoea.
<i>Tridax procumbens</i> L.	Asteraceae	Bisalyakarani (O)	Leaves	Plant is used to treat wounds and dysentery.
<i>Wedelia chinensis</i> (Osbeck) Merr.	Asteraceae	Bhringaraj (O, H)	Whole plant	The whole plant is used to treat skin diseases.
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kantaleutia (O), spiny pig weed plant (E)	Seed	It is used as a poultice to treat broken bones.

(E- English, H-Hindi, O-Odia)

**Figure 2:** Total number of species present in the corresponding family





**Figure 3:** Plant parts used as medicine



**Figure 4:** Some important medicinal herbs

- A) *Centella asiatica*, B) *Oxalis corniculata*, C) *Indigofera cassioides*, D) *Mecardonia procumbens*, E) *Hemigraphis latebrosa*, F) *Polygala arvensis*



**Figure 4.1:** Some important medicinal herbs

G) *Rotala rotundifolia*, H) *Mazus pumilus*, I) *Nelsonia canescens*,  
J) *Knoxia sumatranensis*, K) *Bacopa monnieri*, L) *Curculigo orchiodes*

## **Conclusion**

Most of the people depends on chemical drug and show less interest in the medicinal plants for which they are going to the threatened level. But in some developing and developed countries major technology are carried out to produce plant derived medicine because it has less or no side effects. Hence, the main duty is to protect and conserve the medicinal herb. It is also necessary to record their beneficial information for future use. The medicinal plant product can be a good source to develop new drugs in future.

## **Acknowledgement**

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# Formulation of Novel Drugs From Selected Plants Against Streptococcus mutans Causing Dental Caries

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## Abstract

Teeth problem is one of the most common diseases in the world, which is generally caused by the gram positive bacteria *Streptococcus mutans* that present in the human mouth. Therefore, an attempt has been made to gather the reported information about the plant those can be used against *S. mutans* and to formulate a drug. This present works aims to develop a formulation that can prevent dental caries. This clinical research involved *in-vitro* studies to determine the of combinations of *Azadirachta indica* (neem), *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* (drumstick) on teeth problems and plaque bacteria followed by evaluation of phytochemical constituents. Results revealed that the plant extracts can be used to make drugs to cure dental caries. It was observed that the drug has minimum or no side effect. The phytochemical screening and antibacterial activities showed its pharmacological potential.

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**Key Words:** Dental caries, Biofilm, periodontal diseases, *Streptococcus mutans*, *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla*,

## Introduction

Problems related to teeth is a common diseases globally and are caused by the pathogenic bacteria and food debris. Some common type of acid producing bacteria, like *S. mutans* colonizes on the dental surface and damage the tooth structure in the presence of fermented primary metabolites (Daboor et al. 2015; Marsh et. al. 2003). The tooth surface is covered with a specific biofilm, a slime layer consisting of numbers of bacterial cells, salivary polymers & food debris (Chandki et al. 2011). The biofilm can easily reach a thickness of numbers of cells on the surface. The formed biofilm, also called plaque which provides site for the colonization of bacterial species (Forssten et al. 2010).

Numbers of bacteria have been found in the oral cavity (Sakamoto et. al. 2005). Oral *Streptococci*, like *S. mutans* are associated with pyogenic and other infections in various sites (Holt et al. 1994; Gross et al. 2012). It is a facultative anaerobic, gram positive bacterium, which appear in chains on gram stain (Sherbiny et al. 2014).

It has homo fermentative property and it is highly aciduric compared with the other alternative oral *Streptococci* (Rajendran et al. 2014). Using an enzyme glucosyl transferase, It produces an extracellular polysaccharide from sucrose, which is responsible for dental caries (Bowen et al. 2011; Taylor et al. 2004; Wright et al. 2002; Boelum et al. 1997).

Penicillin and erythromycin have been reported to prevent dental caries in animals and humans but they are never used clinically because of their many adverse effects (Kubo et al. 1992). Some natural remedies with the use of medicinal plants, which are good reservoirs of chemo therapeutants, can be contributed as an alternative for antibiotic effects.

In our study, authors have focused on the formulation of herbal drugs using the extracts of four plants, Such as *Azadirachta indica*, *Tinospora*

*cordifolia*, *Glycosmis pentaphylla* and *Moringa olFeifera*. *Azadirachta indica* commonly known as neem possesses the phytochemical constituents like nimbidin, azadirachtin, gallic acid, catechine and margolone. All these exhibit potent antibacterial activity. The chief active constituent of neem is azadirachtin, which is an antimicrobial agent (Bhanwara et al. 2000; Sharma et. al. 2011). Neem extract is rich in antioxidants and helps to boost the immune response in gum and tissues of the mouth (Kapoor et al. 2010; Subapriya et al. 2005). Studies reported that the neem extracts have antimicrobial effects on salivary *S. mutans* causing dental caries (Patil et al. 2010).

*T. cordifolia* is a climber and known as guluchi. It could be formulated as mouth wash and used to prevent plaque and gingivitis. *M. oleifera* known as drumstick tree extracts can be used as drugs for treatment of dental caries because it inhibits the growth of bacteria in the dental plaque.

*Glycosmis pentaphylla* is a shrub. A decoction of root of *G. Pentaphylla* is used for facial inflammation treatment (Chopra et al. 1969; Athikomkulchai et al. 2006). These herbal drugs now a days used broadly because these are less toxic and less effective and have no or very less side effects.

## Methods

### Identification and Collection of Experimental Plants from Study Area

The experimental plant species like *T. cordifolia*, *G.s pentaphylla*, *A.indica* and *M. oleifera* were identified by Dr. Sanjeet Kumar following Flora's books (Haines 1925; Saxena and Brahmam 1995) and collected from Chandaka village, Bhubaneswar for experimental work (Saxena and Brahmam 1995).

### Ethnobotanical Data Collection on Selected Plant

The results are based on the field work conducted with local communities of study area using standard methods (Hawkes, 1980; Christian and Brigitte 2004; Cunningham 2001).

### Preparation of Plant Extracts

Soxhlet method and percolation were adopted to obtain the plant extract (Tiwari et al. 2011; Figure 1-4).

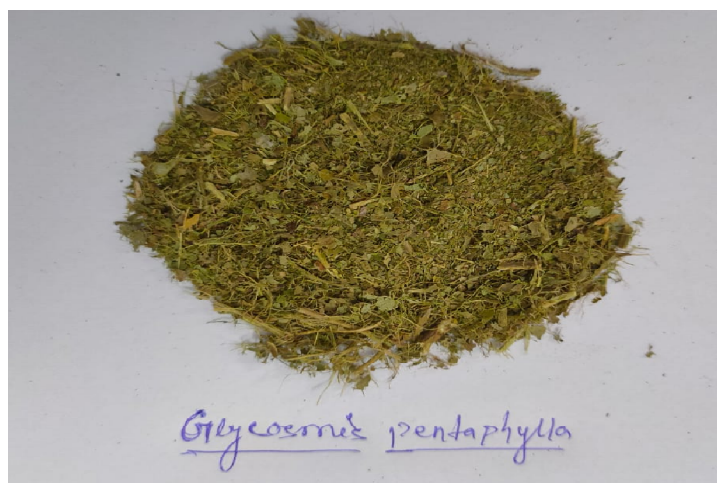


Figure: 1, 2: Powder of dry leaves of *Azadirachta indica* and *Glycosmis pentaphylla*





Figure 3: Dried drumstick



Figure 4: Powder of dried leaf of *Tinospora cordifolia*

### **Methanol Extraction**

5 g of the powder of each selected plant extracts are taken in different beakers and 50 ml of methanol was added to each extract. Then the extraction is kept in refrigerator for minimum 24 hours.

### **N- Hexane Extraction**

5 g of powder of each plant extract are taken in different beaker. 50ml of n- hexane was added to each extract and then kept in the refrigerator for minimum 24 hours.

### **Aqueous Extraction**

5 g of powder of each plant extract is taken in different beakers and 50ml of distil water was added to the extracts. Then the extraction is kept in the refrigerator for minimum 24 hours. After 24 hours all the extractions were stained through funnel and filter paper for further phytochemical tests.

### **Phytochemical Assays**

Analysis of bioactive compounds were carried out using standard methods (Harborne 1973; Trease and Evans 1989; Sofowara 1993; Raaman 2006; Tiwari et. al. 2011 Figure 5-12).

### **Phytochemical Tests of Extraction of *Tinospora Cordifolia***

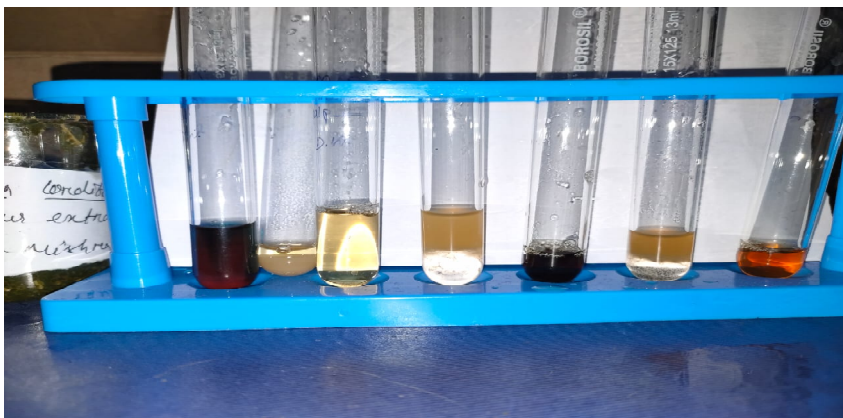


Figure 5: Phytochemical test of aqueous extract of *Tinospora cordifolia*



Figure 6: Phytochemical test of methanol extraction of *Tinospora cordifolia*

**Phytochemical Tests of Extractions of *Glycosmis Pentaphylla*:**



Figure 7: Phytochemical tests of methanol extractions of *Glycosmis pentaphylla*



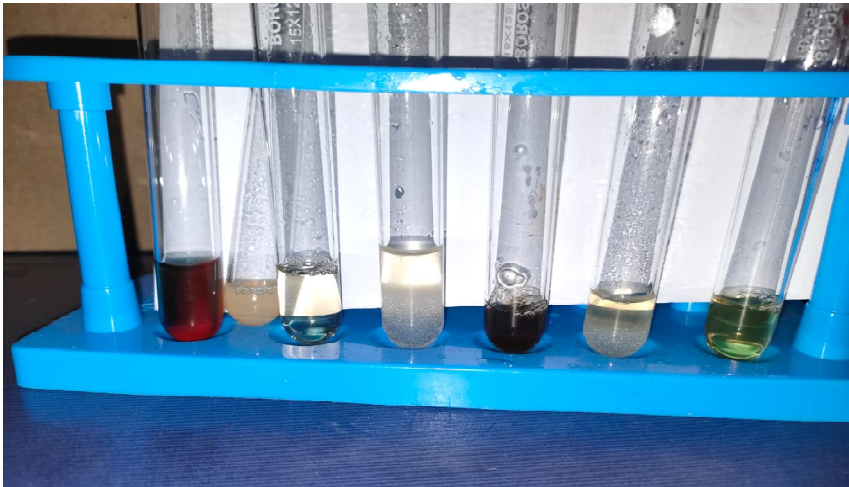


Figure 8: Phytochemical tests of aqueous extraction of *Glycosmis pentaphylla*

### Phytochemical Tests of *Azadirachta Indica*

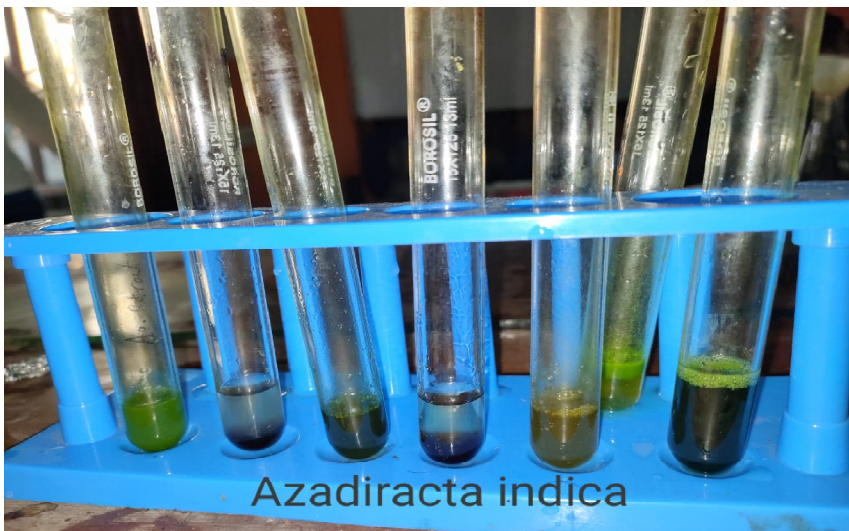


Figure 9: Phytochemical tests of methanol extraction of *Azadirachta indica*

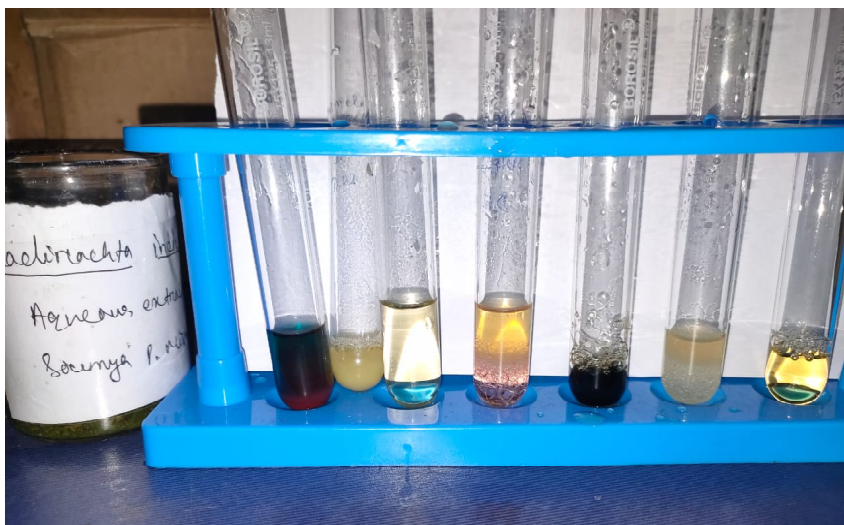


Figure 10: Phytochemical tests of aqueous extraction of *Azadirachta indica*

### Phytochemical Tests of Extractions of *Moringa Oleifera*

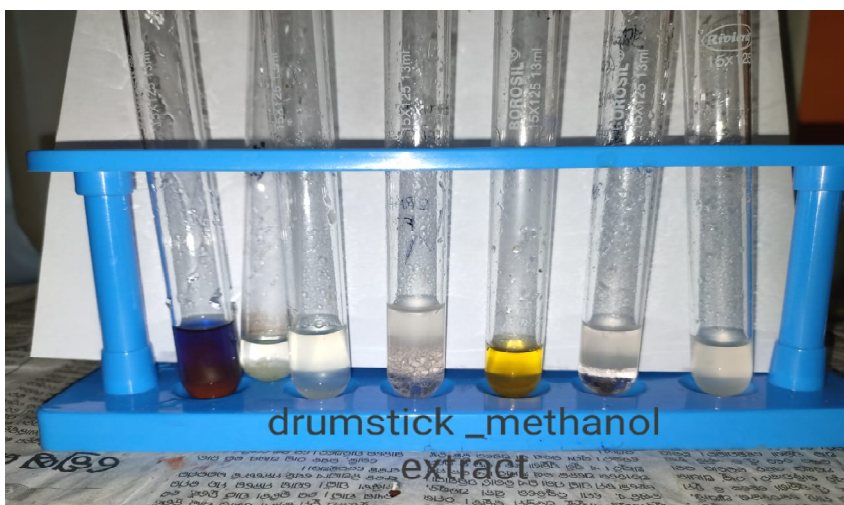


Figure 11: Phytochemical tests of methanol extraction of *Moringa oleifera*



Figure 12: Phytochemical tests of aqueous extraction of *Moringa oleifera*

### **Preparation of Mixture of Powders f Selected Plant Extracts for Formulation**

To prepare powder for formulation, 10 % powder of *Tinospora cordifolia* extracts, 10% powder of *Glycosmis pentaphylla* extracts, 30 % powder of *Azadirachta indica* extracts and 50 % powder of *Moringa oleifera* extracts are mixed in a jar and kept for further formulations.

### **Antibacterial Activity**

The extracts of plant parts and formulation were screened for antibacterial activity against *Streptococcus mutans* (MTCC 497) using standard methods (Scorzoni et al. 2007;Wiegand et al. 2008;Amanda et al. 2012; Zare et al. 2012;Thompson et al. 2013).

## Results

This study was carried out to demonstrate that the plant *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* extracts have a very good antibacterial activity against *Streptococcus mutans* causing dental diseases. Based on informations collected about the medicinal values of these plants from study area and literature, an attempt was made to justify the rationale behind the claims and to identify the presence of bioactive components in leaf and stem extracts through qualitative tests. The extracts of these selected plants were analyzed to know the presence of the metabolites in them. The phytochemical screening was done to examine the presence of the secondary metabolites such as saponin, terpenoids, steroids, tannin, flavonoids, phenolic compound and reducing sugar. The table 3 shows the results of the phytochemical tests.

**Table 3:** Phytochemical Tests of selected experimental plant parts

Plant name	Plant part	Solvent	Metabolites present
<i>Azadirachta indica</i>	Leaf	n-Hexane Methanol Aqueous	Saponin, steroid, Flavonoid, tannin, reducing sugar, phenolic compound
<i>Tinospora cordifolia</i>	Leaf	n-Hexane Methanol Aqueous	Saponin, tannin, Flavonoid, reducing sugar, phenolic compound
<i>Glycosmis pentaphylla</i>	Leaf	n-Hexane Methanol Aqueous	Tannin, saponin, reducing sugar,
<i>Moringa oleifera</i>	Fruit	n-Hexane Methanol Aqueous	Saponin, Flavonoid, tannin, reducing sugar,

**Table 4:** Agar well diffusion assay of Aqueous extract of formulated powder

Pants parts	Bacteria	Extract	Concentration	Zone of inhibition
<i>Formulated powder</i>	<i>S. mutans</i>	Aqueous	400 mg/ml	3.0 cm
			250 mg/ml	2.7 cm
			200 mg/ml	2.4 cm
			50 mg/ml	2.0 cm

**Table 5:** Disc diffusion assay of Aqueous extract of formulated powder

Plant parts	Bacteria	Extract	Concentration	Zone of inhibition
<i>Formulated powder</i>	<i>S. mutans</i>	Aqueous	400 mg/ml	1.4 cm
			250 mg/ml	1.2 cm
			200 mg/ml	1.0 cm
			50 mg/ml	0.7 cm



**Table 6:** MIC of Aqueous extract of formulated powder

Plant name	Bacteria	Extract	Different concentrations of drugs	
			400 mg/ml	NO GROWTH
Formulated powder	<i>S. mutans</i>	Aqueous	250 mg/ml	NO GROWTH (MIC)
			200 mg/ml	GROWTH
			50 mg/ml	GROWTH

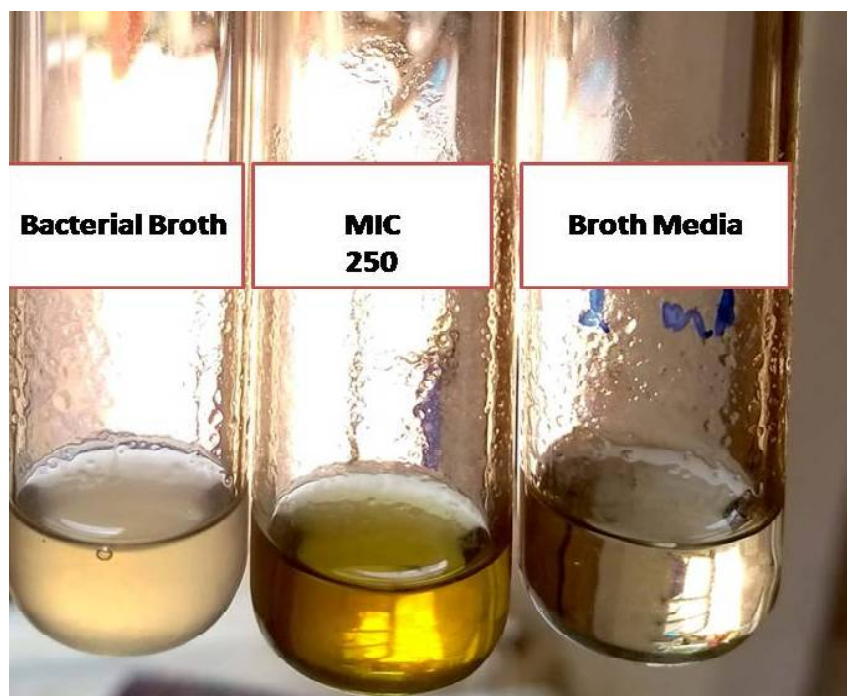


Figure 18: Minimum Inhibitory Concentration against *S. mutans*

## Discussion

Using herbs to cure various diseases is an trend globally. The herbal formulation used in this trial appears to be equally effective as the other available medicines. The polyherbal formulation contains four plant extracts, *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera*. The phytochemical screening revealed that they have diverse metabolites are listed in the table 3. The secondary metabolites present in most of the extracts were saponin, tannin, flavonoids, phenolic compound and reducing sugar.

Traditionally saponins have been extensively used as detergents, as pesticides and molluscicides, in addition to their industrial wide range of pharmacological activities including expectorant, anti inflammatory, vasoprotective, hypocholestrolemic, immunomodulatory, hypoglycaemic, antifungal and antibacterial activities. Tannins are plant poly phenolic compounds and are called antimicrobial biomolecules. Tannins have good antimicrobial activities against several gram positive and gram negative bacteria. From many anti infective researches, it was observed that flavonoids have anti bacterial, anti fungal and antifungal effects. The table 2 and table 3 containing the results of Disc Diffusion and Agar well Diffusion tests shows the zone of inhibition of bacteria *Streptococcus mutans* at different concentrations of the extracts of the formulated powder of the four plant extracts. The table 4 containing the results of MIC shows that there is no growth of the bacteria at different concentrations of the formulation. The combination of extracts of 4 plants, *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* inhibit the growth *S. mutans* with MIC of 400mg/0.4g, 250mg/0.25g, 200mg/ 0.2g and 50mg/0.05g. MIC of the combinations of the plants extracts against this bacterium was varying between 0.05g to 0.4g and its antimicrobial efficacy was found to be good. This was the first of its kind, where MIC of combination of *Azadirachta indica*,

*Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* was assessed on oral bacteria. Hence our result could not be compared with previous published literature.

## Conclusion

Plant based drugs have an emphasized role in maintaining the oral hygienic nature as well as preventive dental caries. The polyherbal formulation containing *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* is good to be used as mouth rinse and tooth paste. This formulation was successfully evaluated including antimicrobial properties. The extracts showed antimicrobial effect against *S. mutans*. Hence, the formulation may be considered as a simple and effective medicine against teeth problems. This formulation may be safer compared to fully synthetic or chemical drug. Further works are need to prove safety and efficacy of the formulated drug. This study demonstrates *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* have antibacterial activity against *Streptococcus mutans*.

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