ज्ञान-विज्ञान विमुक्तये

# NATIONAL SEMINAR

ON

# TRADITIONAL MEDICINE

And

# HEALTH PRACTICES

(Sponsored by UGC [SERO] HYD)

26th and 27th October, 2013

PROCEEDING

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**DEPARTMENT OF BOTANY**

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On

# Traditional Medicine

&

# Health Practices

**EDITOR**

**Dr. Samineni Rama Mohana Rao**

*M.Sc,Ph.D,LL.B,MBA(Exe.),M.Ed,M.Sc(Psyc.),*
*Lecturer in Botany & Nodal JKC Coordinator,*
*SR&BGNR Govt. Degree College,*
*Khammam-507002*

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## PREFACE

The brief volume consists of a good number of articles that are presented in the National Seminar sponsored by UGC on "Traditional Medicine & Health Practices" held on 26th and 27th October,2013 in SR&BGNR Govt Arts & Science College Khammam.

Ancient man; for curing their diseases relied on plant products in the name of Ayurveda, Siddha , Unani, Naturopathy etc. The Divine nature of Ayurveda was explained in the Ancient literature i.e Charaka Samhita, Sushrutha Samhita.The subject Ethnobotany is attracting the world researchers. The dreadful diseases like AIDS, Cancer and other diseases like Jaundice ,Diabetes etc are cured by using wonderful plant products. To get quick relief modern man is relying on expensive modern medicines by neglecting the Traditional Medicine, Which is very cheap and free from other side effects.

In the form Neutraceuticals, and in the form of phytochemicals, secondary metabolites of the plants are having significant value in preventing and controlling the disease.

Now the Folklore medicine is the cynosure to the world community .Every body is very keen to know the importance the locally available plants and how they are keeping their health in a sustainable manner. This curiosity helps the researchers to interact with tribal people, to identify the plants located in their surroundings where they are living.

Scientifically the researchers wants to explore, how the phytomedicine is curing the body ailments.,and On which target organ it is acting .etc .Once the formulations were known to the Scientific community, it becomes much useful to the common public, for the supply of the low cost Phytomedicine.

Most of the valuable plants are disappearing ,due to man made activities as well as Natural calamites. So it is our responsibility to preserve the Endangered and Endemic flora either through "-Insitu " nor "Exsitu "conservation. Biotechnology is one of the interesting tool in the hands of man to raise the Endangered species.

As the health consciousness is increasing in the public, so that they are showing very much interest to know the plant products etc for preventing the diseases as well as curing.

Keeping in view of the public Enthusiasm,to know the Traditional Medicine Practices, this seminar was organized, by inviting the Reputed researchers, who are familiar with the knowledge of Folk medicine for last few decades.

On this platform sharing the knowledge among the researchers and students community will be greatly helpful to take this subject in to their daily life.

To familiarize the locally available plants to the common public and researchers an exhibition was organized on 25th To 27th October 2013. The seminar was inaugurated by the former vice chancellor of Kakatiya University Professor. Vidyavathi

A Key note address was given by the former director of BSI,&NBRI, and the present director for Amity Institute of Herbal products of Trivandrum.Dr.RaghuramSingh Chief conservator of forest Ooty, an eminent tribal medicine expert Sri, Dr.Koppula Hemadri, an expert in Ayurvedic Medicine Dr.PammiSatyanarayana Sastry, an emiretus professor T.Pullaiah from S.K.University,Professor.Srinath from Gulberga University,professor V.S.Raju from Kakatiya University,and Professor A.Raghu Rama Rao Dean for Pharmaceutical sciences of Kakatiya University was participated and presented the papers.

Students from the local colleges, Satavahana University,Telangana University participated in the poster presentation.The chair person and principal of the college Dr.S.Madhava Rao addressed the gathering and emphasized the importance of Traditional Medicine in daily life. The convener of the seminar Dr.S.Rama Mohana Rao on the last day summarized the Two days proceedings. The valedictory function was presided by professor M.A.Singaracharya ,Dean college development council of Kakatiya University Warangal.

Prof.P.Pusphangadhan in his keynote address stated that the Traditional Medicine is having good fortune in 21st Century. How a technology is helpful for enhancing the phytochemicals in the plant and the methods to be adopted for getting of the drug from plant without contamination.By the end of the 21st Century again,People may think about their ancestors and the methods adopted by them for curing the diseases.

Prof.K.Hemadri, Former B.S.I. Scientist, who contributed a lot to Ethnobotany stated that the tribal people are getting very less,after their knowledge is transferred to scientific community.

Based on that the scientific community is obtaining patents, Some royalty should be given to the tribes who first deciphered their knowledge.

Pammi Satyanarayana Sastry an Eminent Ayurvedic Practitioner from Vijayawada, Stated that,the secretary products of plants i.e gums how they are helpful for preserving Human health was explained.

## Acknowledgements

The papers presented in this volume are both extempore speeches that are transformed into paper form, given significance of the ideas expressed therein. Some others are presentations that are read out in the UGC sponsored National Seminar on "Traditional Medicine & Health Practices" held during 26th and 27th October,2013 in SR&BGNR Govt. Arts & Science College, Khammam.

We extend our gratitude to the UGC for extending financial support both for the conduct of seminar as well as the publication of proceedings. We are also grateful to the commission of collegiate education AP, Hyderabad, for according permission to conduct the seminar. We are deeply indebted to the principal of our college for his valuable guidance and encouragment in all aspects.

We are thankful to all the paper presenters and the other participants whose active participation and co-operation definitely added the needed touch of seriousness to the proceedings of the seminar that is expected in a National Seminar. Finally,our deep sense of gratitude goes to all the other sponsorers of the seminar. The spirit which with they have come forward to help in their own way is very encouraging and makes one feel optimistic to take up the activities of this sort. The help extended by the other Faculty of the department is invaluable.

To conclude, we are hopeful, the lessons that we learnt, the fresh insights that we have about human nature, may go a long way in tempering me.

- Editor.

## FOREWORD

I feel it my privilege to pen the foreword for the proceedings of the seminar on "Traditional Medicine and Health Practices" held During 26th& 27th October 2013. The very purpose of the seminar is to share the ideas and practices that help us to improve the lapses in the teaching and learning process if any. Moreover , it may not be possible for everyone to attend the seminar and this proceedings may be helpful to all.

Hence, If the proceedings are brought out in the form of book nor in the form of e-journal, naturally it would reach out to the interested people and the desired purpose would be served. As such I appreciate the faculty of Department of Botany,and others whoever have done their contribution to make it possible. Our college owes much gratitude to the University Grants Commission, Hyderabad,for its financial assistance, but for which we would not have so easily taken up this academic activity of contemporary relevance

Dr.S.Madhava Rao, M.Sc, Ph.D

Principal

SR&BGNR Govt.Arts& Sceince College,

Khammam.

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# Ethnobotanical Studies On Medicinal Plants Used By The Tribes Of Bhadrachalam Forest Area,Andhra Pradesh, India.

*__P.Earnest Vijayanand, ** D.Ramesh__, Lecturer in Botany, Govt. Degree & P.G.College, Bhadrachalam, Khammam (Dist) email: earnest.anand75@gmail.com

**ABSTRACT:**

Traditional healing systems play an important role in maintaining physical and psychological well being of the vast majority of tribal people in India. Today continued deforestration and environmental degradation in many parts of India brought about depletion of medicinal plants and association of knowledge. The need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resource receives more and more recognition. Moreover, an increased emphasis is being placed on possible economic benefits especially of the medicinal use of tropical forest products instead of pure timber harvesting.

A preliminary survey of medicinal plants used by the Koyas and Konda Reddies who are living in bhadrachalam forest area of the Khammam district of Andhra Pradesh is reported in this paper.

**KEY WORDS :**Medicinal plants. Used by the tribes. Bhadrachalam forest area.

**INTRODUCTION :**

Plants provide food, shelter, clothing and medicine to humankind. Plants curing ailments are known to mankind since time immemorial. Rich and diversaified heritage of these invaluable traditional knowledge systems on medicinal plants is of immense significance in the context of fast erosion of cultural diversity in different parts of the world especially in tropical countries like India The diversity of medicinal plants and their rich therapeutic traditional knowledge in the country necessitated intensive research in this domain.

Traditional healing systems play an important role in maintaining physical and psychological well being of the vast majority of tribal people in India. Today continued deforestration and environmental degradation in many parts of India brought about depletion of medicinal plants and association of knowledge. The need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resource receives more and more recognition. Moreover, an increased emphasis is being placed on possible economic benefits especially of the medicinal use of tropical forest products instead of pure timber harvesting.

Bhadrachalam is located in khammam district, Bhadrachalam forest area lies between $17^0$38' and $18^0$40'north latitudes and between $80^0$20'and $81^0$10'east longitudes of north eastern part of Andhra Pradesh. The total geographical area of the Bhadrachalam forest division is 1,96,500 Ha with 1,45,000 Ha under forest.Bhadrachalam forest division is a territorial wild life division. The terrain shows great variation in the altitude with constituting high range of hills.Bhadrachalam forest division which is one of the major tribal inhabited area in Andra Pradesh. The main tribes of bhadrachalam forest area are Koyas and Konda Reddies. The Bhadrachalam forest area consists of a range of massive, unbroken chain of rugged hills. Most of the interior region are still undisturbed and very diverse.

Bhadrachalam forest area is mostly along the Godavari river banks well marked plants are present. The indigenous communities live in the interior parts of forest area. An extent of 2000 hahas been provided as tribal settlements inside the forest area.

The Koyas and Konda Reddies were living in the interior parts of forest area They choose faith healing first, traditional herbal medicine next and modern medicine only when the first have failed. However the Bhadrachalam forest area is relatively unexplored and little work has been done in context of etnobotany. So the present study was undertaken,and an attempt was made to document the ethno botanical knowledge of the tribals koyas and kondareddies who are living in this forest area.

METHODOLOGY :

For the collection of ethno botanical data with the help of our college students field trips were carried out in bhadrachalam forest area covered villages like kunavaram, v.r. puram,

chintoor,interacted with the healers belongs to the koya and kondareddy tribes and collected the information of medicinal plants. We asked to furnish the information on the local name and using medicinal plant part ,use of medicinal plant.Plant specimens were collected and later identified by using floras.

**I . Gamble JS & Fisher CEC 1915 – 1936 Flora of presidency of madras, London.**

**2 . Pullaiah T et al Flora of Andhra Pradesh, Scientific publishers, Jodhpur.**

**Conclusion :**

The study indicates that, So many plant species are used by the tribal people. The tribal people utilize the plants for various diseases. In Bhadrachalamm forest area we identified more than 50 species are utilised by the tribes of koyas and konda reddies. For treating a single ailment or disease the tribals use same plant species like stomach problems, head ache and treating skin diseases. More than one part of the same plant was used by the tribals notable

| S.No | Botanical Name of the plant | Vernacular Name | Plant part used | Use |
|---|---|---|---|---|
| 01 | Achyranthes aspera | Uttareni | Leaves | Sprains, Insect bites |
| 02 | Acalypha indica | Muripinda | leaves | Skin diseases |
| 03 | Aerva lanata | Pindiaku | Roots | Healing wounds |
| 04 | Aloe veera | kalabanda | Whole plant | Sprains,veternery medicine |
| 05 | Bauhinia racemosa | Are | Stem bark | Diarrhoea |
| 06 | Madhuka longifolia | Ippa | bark | Stomach pains |
| 07 | Emblika officinalis | usiri | fruits | Animia, indigestion |
| 08 | Asperagus recimosa | Pilli teegalu | Roots,corm | Menstrual problems |

| | | | | |
|---|---|---|---|---|
| 09 | Andrographis neesiana | nelavemu | leaves | Snake bite,skin diseases |
| 10 | Alternanthira sessiles | ponnagantikora | roots | Tooth diseases |
| 11 | Cassia fistula | Rela | Bark,roots | Cuts&wounds,toothache,liver disorders |
| 12 | Bulbophyllum sps | Adavi ulli | tubers | Good healths & healing wounds |
| 13 | Butea monosperma | Moduga | Roots | Stomach pain, piles |
| 14 | Calotropis gigantia | Jilledu | Flowers | Paralysis |
| 15 | Cocculus hirsutus | Dusara teega | Root | Antidote,snake bite |
| 16 | Coldenia procumbens | hamsapadi | Roots, leaves | Nervous disorders |
| 17 | Diospyros sps | pandupilli | Stem bark | Stomach disorders |
| 18 | Terminalia arjuna | Maddi | Stem bark | Gynocological disorders |
| 19 | Strychnos nuxvomika | Mushti | bark | Stomach ache, snake bite |
| 20 | Crinum defixum | seepachettu | Leaves,bulbs | Ear infections,cough, scabies |
| 21 | Datura metal | oometha | Leaves, seeds | Skin diseases, curing boils |
| 22 | Terminalia chebula | Karaka | fruit | Cough, soar throat |
| 23 | Schleichera oleosa | kusuma | Seeds | Ulcers,Gastric trouble, Skin diseases |
| 24 | Vitex altissima | Nemali adugu | Stem bark | Snake bite |
| 25 | Solanum pubiscens | Nela vakudu | Fruit | Stomachache, tooth ache |
| 26 | Euphorbia hirta | Reddivari nanubalu | chitrapala | Skin diseases,disentary |

| | | | | |
|---|---|---|---|---|
| 27 | Argemone mexicana | nelarakkasi | Roots,Seeds | Skin diseases,fever |
| 28 | Cissus quadrangularis | Nalleru | Stem | Bone fractures |
| 29 | Coccinia grandis | dondaku | Leaves | Ear pain |
| 30 | Phyllanthus amarus | Nela usiri | Fruits | Jaundice |

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# Anticancer agents from medicinal plants: A mini review.

**Kavya M and Srinath Rao***

**Plant tissue culture & genetic engineering Lab.**

**Department of Botany Gulbarga University Gulbarga**

**ABSTRACT:**

Cancer is a major public health burden in both developed and developing countries. Plant derived agents are being used for the treatment of cancer. Cancer is nowadays used as a generic term describing a group of about 120 different diseases, which can affect any part of the body and defined as the state characterized by the uncontrolled growth and invasion of normal tissues and spread of cells (Yarbro et al., 2005). According to WHO reports cancer is a leading cause of premature death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) only in 2008 (Ferlay et al., 2010)] The number of all cancer cases around the world reached 12.7 million in 2008 and is expected to increase to 21million by 2030. Several anticancer agents including taxol, vinblastine, vincristine, the camptothecin derivatives, topotecan and irinotecan, and etoposide derived from epipodophyllotoxin are in clinical use all over the world. A number of promising agents such as flavopiridol, roscovitine, combretastatin A-4, betulinic acid and silvestrol are in clinical or preclinical development.

## INTRODUCTION:

Plants have been used for the treatment of various diseases for thousands of years. As civilizations grew from 3000 BC onwards in Egypt, the Middle East, India and China, the uses of herbs became more sophisticated and written records were prepared. Terrestrial plants have been used as medicines in Egypt, China, India and Greece from ancient time and an impressive number of modern drugs have been developed from them. The first written records on the medicinal uses of plants appeared in about 2600 BC from the Sumerians and Akkaidians .The "Ebers Papyrus", the best known Egyptian pharmaceutical record, which documented over 700 drugs, represents the history of Egyptian medicine dated from 1500 BC. The Chinese *Materia*

*Medica,* which describes more than 600 medicinal plants, has been well documented with the first record dating from about 1100 BC (Cragg et al., 1997). Documentation of the Ayurvedic system recorded in Susruta and Charaka dates from about 1000 BC (Kappor, 1990). The Greeks also contributed substantially to the rational development of the herbal drugs. Dioscorides, the Greek physician (100 A.D.), described in his work "De Materia Medica" more than 600 medicinal plants (Samuelsson, 1999). The World Health Organization estimates that approximately 80% of the world's inhabitants rely on traditional medicine for their primary health care (Farnsworth et al., 1985). Cancer is a major public health burden in both developed and developing countries. Cancer is a major public health burden in both developed and developing countries. It was estimated that there were 10.9 million new cases, 6.7 million deaths, and 24.6 million per-sons living with cancer around the world in 2002 (Parkin et al., 2005). Cancer is the second leading cause of death in the United States (Hoyer, et al., 2005), where one in four deaths is due to cancer. Plants have long been used in the treatment of cancer (Hartwell, 1982). The National Cancer Institute collected about 35,000 plant samples from 20 countries and has screened around

114,000 extracts for anticancer activity (Shoeb, 2005). Of the 92 anticancer drugs commercially available prior to 1983 in the US and among worldwide approved anticancer drugs between 1983 and 1994, 60% are of natural origin (Cragg et al., 1997). In this instance, natural origin is defined as natural products, derivatives of natural products or synthetic pharmaceuticals based on natural product models (Jaspars and Lawton, 1998). Cancer cells exhibit deregulation in multiple cellular signaling pathways, yet all cancers share a number of common hallmark capabilities, such as genetic instability, self-sufficiency in growth signals, insensitivity to anti-growth signals, avoidance of apoptosis, unlimited replication, sustained angiogenesis, and tissue invasion and metastasis (Ziech et al., 2012).Therefore, utilizing specific agents to target single pathways is a tactic that frequently fails in cancer therapy. Genetic instability produces intra-tumoral heterogeneity that enables adaptive resistance. Combination chemotherapy that targets a number of distinct molecular mechanisms is therefore preferable and considered more promising, but the use of multiple agents is often constrained due to corresponding increases in toxicity (Sarkar and Li, 2009)

**PLANT DERIVED ANTICANCER AGENTS IN CLINICAL USE:**

The isolation of the *Vinca* alkaloids, **vinblastine** and **vincristine** from the Madagascar periwinkle, *Catharanthus roseus*. (Apocynaceae) introduced a new era of the use of plant material as anticancer agents. They were the first agents to advance into clinical use for the treatment of cancer (Cragg and Newman, 2005).

1. Vinblastine: Brand name (Velbe ®)Vinblastine is an anti microtubule drug used to treat certain kinds of cancer, including Hodgkin's lymphoma, non-small cell lung cancer,breast cancer, head and neck cancer, and testicular cancer. It is also used to treat Langerhans cell histiocytosis. Vinblastine was first isolated by Robert Noble and Charles Thomas Beer at the University of Western Ontario from the Madagascar periwinkle plant. Vinblastine's utility as a chemotherapeutic agent was first suggested by its effect on the body when an extract of the plant was injected in rabbits to study the plant's supposed anti-diabetic effect. (A tea made from the plant was a folk-remedy for diabetes.) The rabbits succumbed to a bacterial infection, due to a decreased number of white blood cells, so it was hypothesized that vinblastine might be effective against cancers of the white blood cells such as lymphoma. It is generated in the plant by the joining of two alkaloids catharanthine and vindoline . Vinblastine is a Vinca alkaloid and a chemical analogue of vincristine. It binds tubulin, thereby inhibiting the assembly of microtubules. Vinblastine treatment causes M phase specific cell cycle arrest by disrupting microtubule assembly and proper formation of the mitotic spindle and the kinetochore, each of which are necessary for the separation of chromosomes during anaphase of mitosis. Toxicities include bone marrow suppression (which is dose-limiting), gastrointestinal toxicity, potent vesicant (blister-forming) activity, and extravasation injury (forms deep ulcers). Vinblastine paracrystals may be composed of tightly-packed un polymerized tubulin or microtubules (Starling, 1976).Vinblastine is reported to be an effective component of certain chemotherapy regimens, particularly when used with bleomycin and methotrexate in VBM chemotherapy for Stage IA or IIA Hodgkin lymphomas. The inclusion of vinblastine allows for lower doses of bleomycin and reduced overall toxicity with larger resting periods between chemotherapy cycles (Gopi et al., 2003).

**2**. **Vincristine:** Brand name, Oncovin, formally known as **leurocristine**, sometimes abbreviated "VCR", is a *Vinca* alkaloid from *Catharanthus roseus* (Madagascar periwinkle), formerly *Vinca rosea* and hence its name. It is a mitotic inhibitor, and is used in cancer chemotherapy. Vincristine is created by the coupling of indole alkaloids vindoline and catharanthine in the *Vinca* plant.They work by preventing mitosis in metaphase. These alkaloids bind to tubulin thus preventing the cell from making the spindles it needs to be able to divide. This is different from the action of taxol which interferes with cell division by keeping the spindles from being broken down. Vinblastin is mainly useful for treating Hodgkin's disease, advanced testicular cancer and advanced breast cancer. Vincristine is mainly used to treat acute leukemia and other lymphomas. is an antimicrotubule drug used to treat certain kinds of cancer, including Hodgkin's lymphoma, Kaposi's sarcoma ,non-small cell lung cancer, breast cancer, head and neck cancer, and testicular cancer I (Cragg and Newman, 2005). It is also used to treat Langerhans cell histiocytosis. Vinblastine was traditionally obtained from *Catharanthus roseus*, also known as *Vinca rosea*, a Madagascar periwinkle. It is generated in the plant by the joining of two alkaloids catharanthine and vindoline

**3**. **Paclitaxel:** The discovery of paclitaxel from the bark of the Pacific Yew, (*Taxus brevifolia* Nutt.) of family Taxaceae, isolated in 1967 by Monroe et al. It was discovered in a US National Cancer Institute program at the Research Triangle Institute, is another evidence of the success in natural product drug discovery. **Paclitaxel** is a mitotic inhibitor used in cancer chemotherapy. When it was developed commercially by Bristol-Myers Squibb (BMS), the generic name was changed to **paclitaxel** and the BMS compound is sold under the trademark **Taxol**. In this formulation, paclitaxel is dissolved in Kolliphor EL and ethanol, as a delivery agent. A newer formulation, in which paclitaxel is bound to albumin, is sold under the trademark *Abraxane*. Paclitaxel is used to treat patients with lung, ovarian, breast, head and neck cancer, and advanced forms of Kaposi's sarcoma. Paclitaxel is also used for the prevention of restenosis.. It's also known as Taxol®. Various parts of *Taxus brevifolia* and other *Taxus* species (e.g., *Taxus Canadensis* Marshall, *Taxus baccata* L.) have been used by several Native American Tribes for the treatment of some non-cancerous cases (Cragg and Newman, 2005) while *Taxus baccata* was reported to use in the Indian Ayurvedic medicine for the treatment of cancer. The structure of

paclitaxel was elucidated in 1971 and was clinically introduced to the US market in the early 1990s (Wani et al., 1971; Rowinsky et al., 1992).

**4. Camptothecin:** Isolated from the Chinese ornamental tree, *Camptotheca acuminate* belonging to family Nyssaceae,in 1966 by Wall and Wani in systematic screening of natural products was advanced to clinical trials by NCI in the 1970s but was dropped because of severe bladder toxicity (Potmeisel, 1995).It is a cytotoxic quinoline alkaloid which inhibits DNA enzyme topoisomerase-1(topo I). CPT showed remarkable anticancer activity in preliminary clinical trials but also low solubility and (high) adverse drug reaction. Because of these disadvantages synthetic and medicinal chemists have developed numerous syntheses of Camptothecin and various derivatives to increase the benefits of the chemical, with good results. Two CPT analogues have been approved and are used in cancer chemotherapy today, topotecan and irinotecan.

**5. Topotecan:** Trade name **Hycamtin**is a semi-synthetic derivative of camptothecin and is used for the treatment of ovarian and small cell lung cancers, and colo-rectal cancers, respectively (Creemers et al., 1996; Bertino, 1997). Epipodophyllotoxin is an isomer of **podophyllotoxin** which was isolated as the active anti-tumor agent from the roots of *Podophyllum* species, *Podophyllum peltatum* and *Podophyllum emodi* of Berberidaceae (Stahelin, 1973).

**Etoposide** and **teniposide:** Theseare two semi-synthetic derivatives of epipodophyllotoxin and are used in the treatment of lymphomas and bronchial and testicular cancers (Cragg and Newman, 2005; Harvey, 1997).

**Homoharringtonine**: It is isolated from the Chinese tree *Cephalotaxus harringtonia* var. *drupacea* (Cephalotaxaceae), is another plant-derived agent in clinical use (Itokawa et al., 2005; Powell et al., 1970). A racemic mixture of harringtonine and homoha-rringtonine has been used successfully in China for the treatment of acute myelogenous leukemia and chronic myelogenous leukemia (Cragg and Newman, 2005; Kantarjian et al., 1996).

**Elliptinium**: It isa derivative of ellipticine, isolated from a Fijian medicinal plant *Bleekeria vitensis* A.C. Sm., is marketed in France for the treatment of breast cancer (Cragg and Newman, 2005).

**Curcumin**: Anticancer activity of the rhizomes of turmeric *(Curcuma longa)* is well documented in literature and is attributed to curcumin isolated from *Curcuma zedoaria* belonging to the family *Zingiberaceae* ,it has been used in the traditional system of medicine in India and Southwest Asia in treating many human ailments and is found to possess many biological activities Isocurcumenol is said to be the active compound and is found to inhibit the proliferation of cancer cells without inducing significant toxicity to the normal cells (Lakshmi et al., 2012).

**Forskolin**: *Coleus forskholii*is useful in the treatment of cancer and congestive heart failure (Vladimir and Majeed, 2004; James, 2003) The active principle of *Coleus forskohlii*, increase cyclic AMP levels in the culture medium of human prostatic cancer cells thereby cellular growth of the cancer is found inhibited. This will be a possible new, safe approach to prostatic carcinoma therapy (Vladimir and Majeed, 2004)

**Betulinic:** It was isolated from *Zizyphus* species, e.g. *mauritiana*, *rugosa* and *oenoplia* (Pisha et al., 1995; Nahar et al., 1997) and displayed selective cytotoxicity against human melanoma cell lines (Balunas et al., 2005).

**CONCLUSION:**

Many secondary metabolites of plant are commercially important and find use in a number of pharmaceutical compounds. Over three-quarters of the world population relies mainly on plants and plant extracts for health care.There are more than 270,000 higher plants existing on this planet. But only a small portion has been explored phytochemically, plants can provide potential bioactive compounds for the development of new 'leads' to combat cancer diseases.Natural products discovered from medicinal plants have played an important role in the treatment of cancer. Natural products or natural product derivatives comprised 14 of the top 35 drugs in 2000 based on worldwide sales. Two plant derived natural products, paclitaxel and camptothecin were

estimated to account for nearly one-third of the global anticancer market. The present review supports the potential of certain medicinal plants. More research can be done to investigate the unknown and unexplored potential of these plants.

**ACKNOWLEDGEMENT:**

The authors thank Dr. Meena R. Chandavarkar Vice Chancellor Karnataka State Women's University Bijapur, Karnataka for her constant encouragement

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**Plate-I: Plants producing Anticancer Compounds**

***Bleekeria vitensis***

***Camptotheca acuminate***

***Cephalotaxus harringtonia***

***Coleus forskohlii***

**Plate-II: Plants producing Anticancer Compounds**

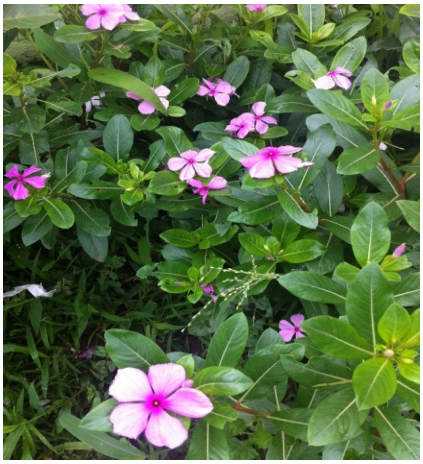
***Curcuma longa* (Plant)**

***Curcuma longa* (Rhizome)**

***Nothopodites foetida***

***Podophyllum hexandrum***

**Plate-III: Plants producing Anticancer Compounds**



***Catharanthus roseus***

***Taxus brevifolia***

***Zizyphus mauritiana*,**

# ANTIMICROBIAL ACTIVITY OF VARIOUS CYANOBACTERIA AGAINST BACTERIAL PATHAOGENS

**N.V. Madhav* M. Arjun and M.Aruna****

*Department of Botany, University College of Science, Satavahana University, Karimnagar.

**. Department of Botany, Telangana University, Nizamabad

**ABSTRACT**

Cyanobacteria have provided a Source of information for a novel drug compound and plant derived medicine have made a significant contribution towards human health and in controlling number of

infections. The cyanobacterial extracts showing antibacterial activity can be Further Subjected to isolation of therapeutic antibacterial and carry out further pharmacological evolution in Present study selected certain cyanobacteria was tested against three bacterial organisms are E.coli, Pseudomonas, Klebsiells, from the above Studies it is concluded that the Cyanobacterial represent new Sources of antimicrobials with stable ways for Use of modern medicine.

**KEY WORDS:**

Cyanobacteria b&11 Media, Inhibition zone

**INTRODUCTION:**

Cyanobacteria are a very old group of organisms and represent relics of the oldest photoautotrophic vegetation in the world that occur in freshwater, marine and terrestrial habitats (Mundt and Teuscher 1986). Cyanobacteria have drawn much attention as prospective and rich sources of biologically active constituents and have been identified as one of the most promising groups of organisms to be able of producing bioactive compounds (Schlegel et al., 1999). Cyanobacteria are known to produce metabolites with diverse biological activities such as antibacterial (Jaki et al., 2000), antifungal (Kajiyama et al., 1998), antiviral (Patterson et al., 1994), anticancer (Luesch et al., 2000), antiplasmodial (Papendorf et al., 1998), algicide (Papke et al., 1997), anti- platelet aggregation (Rho et al., 1996) and Immunosuppressive (Koehn et al., 1992) activities. Cyanobacteria from local habitats seem to be a source of potential new active

substances that could contribute to reduction of the number of bacteria, fungi, viruses and other microorganisms (Mundt et al., 2001). Cyanobacteria have not yet been studied for antimicrobial activity and little work has been done to screen cyanobacteria isolated from soils with regard to their production of bioactive compounds. In order to find the potential of cyanobacteria for production of antimicrobial compounds in agricultural field.

In this study, some microalgae were tested wherein we report their efficacy against few pathogenic microorganisms.

**METERIAL AND METHODS:**

Isolation and Identification of cyanobacterias Soil Samples were collected from different agricultural

Fields in Karimnagar District, Soil Samples were Directly cultured in Nitrogen free BGII media (Bruwitzka and Bruwitzka, 1988) offer colonization cyanobacteria were transferred to the same medium Each isolated cyanobacterium was cultured in a 250 ml Flask containing 100 ml of BGll medium without

Shoaling for 30 days incubation of 28c'+2 and illumination of 3000 lux with a white continuous Light. The cyanobacteria and identification was done using morphological Variation studies and taxonomical

Approaches (Desikachry 1959, Prescott 1962 and Anand et.al 1990) Preparation of Extact for antimicrobial activity the cultures were harvested after 30 days by centrifuge fiow at 10,000-r pm for 10. Minutes the amorous Supernatant was collected and afzel nellet was extracted with 15 ml of ethances followed by 15 ml of hexane, with shaking for 20 min. The culture supernatants' and solvent extracts were dried under reduced pressure at 40c and were stored at 10c for further studies filter papers in dried extracts and super natat in 4 ml of their extracts solvent.

The following bacteria were used as test organisms:

**E. COLI, PSEUDOMONAS, & KLLEBSIELLA:**

Test organism plates were incubated at 37c, for a period of 18-24 hours. Discs treated with 50ml.

Ethanol was used on negative controls and gentamycine diser wele used (10ml) as positive controls. The

Extracts and supernatant containing antimicrobial components produced district, clear circular zones

Of inhibitions around the diameters of clear zones were determined and used as indication of antimicrobial activity.

**RESULTS AND DISCUSSION:**

The result of culture supernatants and ethanolic extracts of the isolated cyanobacteria that demonstrated

Antibacterial activity are shown in table 1.Supernantant and ethanol extract of 5 strains from the 80

Cyanobacteria strains, showed significant antibacterial activity against bacteria. two of them were identified an Nostoc species, where two anabaena species & one cylindrospermum sps. In the present pilot screening of cyanobacterial extracts of 5 species were found to show spicier specific activity against the 3 human pathogens. The details of activity of aqueous and ethuol extracts of alia along with activity

profile with standard commercial antibiotics (gentamycine) was present in table 1 and 2 antibacterial

activity of cynobacteria aqueous and ethanolic. Extracts against Ecoli pseudomonas klebsiella shown

in table-1. Maximum antibacterial activity was shown against E.coli, pseudomonas & klebsiellea of bacterialpathojens. This is interesting that the traditional method of treating a bacterial infection was by

administering a decolonization of the cyanobacteria, whercar according to our results an organic solvent

hence, this may be more beneficial. Among the 3 Bacterial Strains investigated E.coli and

Pseudomonades are the most resesistance. A large number of microbial extracts and exctraculture products have been found to have antibacterial activity. However, pH of the medium, incubation period and Temperature of inoculation period and temperature of incubation were very important to the biosynthesis Of antibacterial agent products as secondary metabolites. Previously (Naoman et.al) reported

That temperature 35 c, PHS and days A few studies have been done to screen cyanobacteria for production of antibacterial substances from agricultural field. Possibly the synthesis highly active toxin in a detains option of cynobacteria in these environments against other organisms like bacteria, fungi, viruses & eukaryotic microbial. In this investigations out of 80 strains of cyanoobacterial isolation 5 showed significant in vitro antibacterial effect. The proportion of the isolates with antibacterial activities was approximately %, 12%, 11%.

As table-1 Nsotoc, anabaena and cylendrosperrmum species produce bioactive substances, which may have potential for antibacterial activity. Although some of the cyanobacteria produce active.

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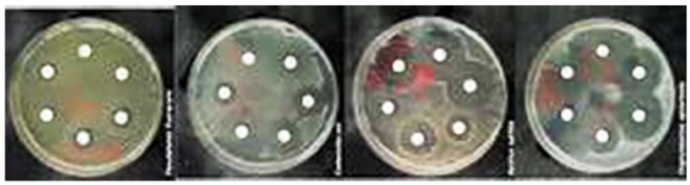

**Fig.1. antimicrobial activity of selected Cyanobacteria on bacterial pathogens**

# INFLUENCE OF GAMMA IRRADIATION ON MORPHOGENETIC RESPONSE IN SHOOT TIP CULTURES OF*CUCUMIS MELO.* L.cv. BATHASA

**Venkateshwarlu.M[1], and *Ugandhar.T[2]**

[1]Department of Botany, University College Kakatiya University Warangal 506009 (A.P.) India.

[2]Department of Botany, SRR Govt. Arts & Science College Karimnagar 505001 (A.P.) India.

***E-mail:tugandharbiotech@gmailcom**

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## ABSTRACT

The application of physical mutagens in tissue culture has been reported by several authors (Botino, 1975 and Skirvin 1978). There have been numerous investigations on the effect of ionizing radiation on callus tissue. The effect of ionizing radiation on callus tissue has been reported in different plant material (Rao and Narayanaswamy, 1975 and Werry and Stoffelsen, 1981). The evidence of low dose radiation treatment in callus cultures have been reported (Degani and Pickholz 1973; and Sharma *et al.,* 1983). Effect of gamma radiation on growth and differentiation of another callus in *Datura* was reported (Jain *et al.,* 1984). Stimulatory effects of low doses of ionizing radiations, not only on growth but also on differentiation in cultured plant cells was demonstrated by several workers (Sharma *et al.,* 1983).Kochbha and Spiegel-Roy (1978) demonstrated that by irradiation and addition of certain growth regulators like IAA to the medium the response of *Citrus sinensis* tissue culture was enhanced.

***Key words:***Gamma irradiation, Morphogenetic response, Shoot tip culture.

***Abbreviations:***IAA= Indole acetic acid; BAP= 6-benzyle amino purine; NAA= Naphalene acetic acid; 2, 4-D= 2, 4-dichlorophenoxy acetic acid; EMS= Ethyle methane sulphonate. MS = Murashige & Skoog medium

## INTRODUCTION

*Cucumis melo cv Bathasa* is an annual climbing or creeping herb with large, soft hairy leaves and spherical, ovoid or elliptic fruits of varying size and colour. The plant is extensively cultivated in the warmer regions of the world for its luscious fruits valued as desert. It is cultivated throughout India, particularly in the hot and dry north western areas. Numerous varieties and races are known differing in the size and shape of the fruits, thickness, colour and

markings on the rind, taste, flavor and the colour of the inner flesh and cultural behavior. The skin may be soft or hard, yellow, green, cream, or orange coloured, with plain netted or echinate surface markings. The colour of the flesh varies from white to cream-yellow orange or green.

## MATERIAL AND METHOD

Shoot tips were cut from the plants growing in green house and were used for the initiation of the callus on MS medium fortified with cytokinin along with an amino acid, L-glutamic acid. Growth response of callus on MS medium supplemented with cytokinin and amino acid was investigated and the results are presented in (Table-1). The maximum percentages of cultures show growth response on MS +2.0 mg/l L-Glutamic acid and 0.5 mg/l BAP. The combination of 2.0 mg/l L-Glutamic acid + 1.0mg/l BAP also showed growth response in increased percentage (Table-I). MS medium supplemented with 1.0-3.0 mg/l BAP + 2.0 mg/l NAA raised the callusing ability and also rooting in cultures. No response was recorded at 15 kR and 20 kR.

**TABLE-1: Influence of gamma irradiation on morphogenetic responses on shoot tip culture of *Cucumis melocv Bathasa. (Seeds)***

| Irradiation | MORPHOGENETIC RESPONSES OF SHOOT-TIP CULTURES | |
|---|---|---|
| kR | MS+2.0mg/l Glutamicacid+0.5mg/l BAP | MS+2.0mg/l Glutamicacid+1.0mg/l BAP |
| Control | Callus + Shoots + Roots | Callus + Shoots + Roots |
| 1kR | Rooting observed on shoots & callus | Green globular callus |
| 2kR | Callus developed with single shoot | Profused rooting |
| 3kR | Profused rooting | Small shoot buds with rooting |
| 4kR | Shoot-tips died, better callus growth | Buds died, better callus growth |
| 5kR | Profused rooting | Profused rooting |
| 10kR | Shoots died after two weeks of culture | Browning of callus observed |
| 15kR | Browning of callus observed | No response |
| 20kR | No response | No response |

**Data scored at the end of four weeks from ten replicate cultures.**

## RESULTS AND DISCUSSION

The application of mutagens to plant cell culture and mutant selection from cultured plant cells has been discussed in several reviews (Skivrin, 1987; Chaleff, 1981; and Meins, 1983). *In-vitro* mutagenesis was used to study the effect of gamma irradiation on morphogenesis. Genetic variability can be induced through *in-vitro* mutagenesis. In the present studies variation in leaf, stem induction of callus and multiple shoot formation were observed. Most of the observations and findings have confirmed the earlier reports. Stimulation was observed in all the explants at low doses (1kR to 5kR) of gamma irradiation in callus and shoot formation. A combination of 3.0 mg/l BAP and 0.1 mg/l NAA favoured formation of compact and profuse callus which is very hard in *Cucumis melo.* On MS medium supplemented with 4.0 mg/l glutamic acid and 0.5 mg/l BAP green and granular callus was produced. Cultures for a single inoculation period (one passage) may last for a few weeks to three months depending on the rapidity of growth. The calli derived from shoot tip explants, when inoculated on MS medium supplemented with auxin or cytokinin and auxin-cytokinin, divided into fragments and served as inocula on the same medium of similar composition, when they were irradiated with low doses of gamma rays a significant increase in fresh and dry weights were observed. Effects of gamma ray irradiation on shoot and bud formation and rooting efficiency of shoot tip explants cultured on MS + 4.0 mg/l glutamic acid + 0.5 mg/l BAP was also investigated (Table-I). At higher doses there is a significant reduction in number of shoots produced and there is total suppression of shoot buds. Complete lethality and no response was recorded when the irradiation was applied at 15kR and 20 kR.

## CONCLUSION

The irradiated shoot tip of *Cucumis melo* were inoculated on MS medium supplemented with cytokinins. Callus proliferated from cut ends with only BAP, that too with a poor percentage of response. 45% of cultures responded for callus proliferation on 2.0 mg/lBAP + 1.0 mg/l 2, 4-D. The explants derived from seeds treated with EMS at six (6) hours duration produced more callus and shoots. The number of shoots and callus decreased with the increase of dose and duration of the mutagen.

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# The Role of Traditional Medicine in 21st Century's Human Health care

**P. Pushpangadan and V. George**

Amity Institute for Herbal and Biotech Products Development

Ravi Nagar, Ambalamukku, Peroorkada P. O

Trivandrum – 695005, Kerala

**Abstract**

India has entered 21st century riding bullock-carts as well as jet crafts and using both the sickle and mechanical harvester. The independent India proclaimed freedom to all its citizens offering opportunity for leading a wholesome, happy and prosperous life. But even after 60 years we could not achieve this goal. 21st century is now acclaimed as the century of biology – The advancements made in Biological sciences if applied appropriately can transform the biodiversity rich nations like India to economic powers. India, blessed with a uniquely rich and varied biodiversity, rich traditional knowledge system and above all a literate/skilled and intelligent human capital is well placed to make such a transformations to happen. Modern drug hunters consider ethno botany as a cost-effective means of locating new and useful compounds of great pharmaceutical value. It is well accepted that the possibility of finding a potential bioactive compound through random screening of plant samples is 1 in 10, 000 and that of hitting a marketable drug is 1 in 4. In contrast the success rate of finding a bioactive molecule through selective screening based on ethno- botanical leads is 1 in 100 and that of discovery of a drug is 1 in 2. Many plant-derived drugs employed in modern medicine were first 'discovered' through ethno botanical investigation. According to a survey conducted by WHO, the use of plant remedies is on the increase even in the developed countries especially among younger generation. In the industrialized countries, the consumers are seeking visible alternatives to modern medicine with its associated dangers of side effects and over medication. The leading US newspaper New York times dated 28.2.'03 reported that side effects of drugs kill more Americans annually than the World War II and Vietnam War combined. Investigations have revealed that in the US 51% of FDA approved drugs have serious adverse effects not detected prior to their approval and that over 1.5 million people are sufficiently injured by prescription drugs annually that they require hospitalization. Once in hospitals, the problem may be compounded. The incidence of serious and fatal adverse drug reaction (ADRs) in US hospitals is

now ranked as between the 4th and the 6th leading causes of death in United States next to heart diseases, cancer, pulmonary diseases and accidents. The promotive and preventive aspects prevalent in oriental medicine, especially in the Indian (Ayurveda, Siddha, Unani and Amchi), and Chinese Systems of medicine are finding increasing popularity and acceptance in the developed countries. During the last decade, WHO's Health Assembly has passed a number of resolutions in response to such a resurgence of interest in the study and use of traditional medicine.

**Key Words:** Traditional knowledge, Pharmaceuticals, Bioactive Compounds, Remedies, Hospitalization, Pulmonary diseases, Promotive and preventive Medicines.

**Introduction**

The role of food and nutrition is now fairly well understood. With the advancement in science, molecular biology and genetic engineering, our ability to understand and manage health at molecular level is manifold increased. It is now scientifically demonstrated that it is possible for one to achieve a high level of health and well being if one takes right food and nutrition that suits one's genetic constitution. Molecular biologists are now busy in designing individualized food, customized food based on one's genetic makeup called 'nutrigenomics'. It has become very clear that traditional food and nutritional recipes, now called ethnic food are best suited for the people living in that particular locality or in similar agroclimatic conditions. Towards the end of the 20$^{th}$ century, this understanding led the health scientists and nutritional experts to scientifically investigate on the traditional foods and that has led to the discovery that the traditional food and other traditional nutritional recipes can be best suited for maintaining a healthy life. It has also led to the development of designer food that suited different groups and also different categories of people suffering from what is now called life style diseases like diabetes, obesity, cancer, arthritis, hypertension etc. Functional foods or medicinal food or pharma food or nutraceuticals are the best treatment regime for curing or managing such diseases. In future, one may first go to genomic expert who will make a genomic profile and based on the genomic profile the dieticians will prescribe a new diet regime or a 'Rasayana' therapy of Ayurveda or advise for a proteomic therapy or a gene therapy.

21$^{st}$ Century is a 'Century of Biology, powered and propelled by knowledge and technology expertise. Electromagnetic radiation turns into masses. The inverse of this process,

turning mass into energy makes nuclear bomb.The advances in Physics led to the development of sophisticated instruments for experimentations that gave better understanding of the structure and functional dynamics of natural objects.Four technologies namely, 1. Biotechnology 2. Herbal technology 3. Information technology (Bioinformatics) 4. Nanotechnology are going to be the most powerful elements that are crucial for prosperity and welfare for the people of nations. Allopathy (Modern medicine) normally single molecules, rigorously tested, structures optimized, toxicologically cleared, mechanism generally known and clinical trials done. Herbals have many molecules, safety and efficacy based on experiences of practitioners. Allopathic drugs known to have severe side reactions (4th – 6th largest cause of death in US) Herbals generally considered benign. Mechanism not known More than 40 % allopathic drugs are plant based.The world today has 7 billion people .By 2050 there will be 12 billion people .1.4 billion people currently live on $1.25 (approx. Rs. 70/-) a day or less. 1.5 billion people in the world do not have access to electricity. 2.5 billion people do not have access to a toilet facility. Almost 1 billion people go hungry every day.

**Traditional diets and nutraceuticals**

The key to the development of health foods/pharma foods or nutraceuticals lies in the value addition in the traditional natural diets. India has over 5,000 years of heritage of health science wherein food has been given an important role in maintaining healthy life. People living in different agroclimatic regions of the country had experimented and made a variety of food and diet and health care products, which is now termed as ethnic foods and ethnic nutritional diets. Ayurvedic medicine as explained earlier deals with a unique system of management called ‘Rasayana which is essentially a combination of food and medicinal herb recipes intended to rejuvenate the whole body system and make it fully healthy and functional.

Phytonutrients/ phytochemicals have tremendous impact on the health care system and may provide health benefits including prevention and treatment of diseases and physiological disorders. Polyphenols are one of the most widely distributed groups of phytochemicals that are responsible for the health promoting effects of nutraceuticals. They range from simple phenols to highly polymerized tannins. They protect plants from oxidative damage and they also play the same role in humans protecting the tissues from oxidative decay there by acting as antioxidants. The outstanding feature of these phytonutrients is their ability to block specific enzymes that

cause inflammation. They also modify prostaglandin pathways and thereby protect platelets from clumping.

Another class of nutraceuticals is represented by the polyunsaturated fatty acids (PUFAs) especially of those n-3 and n-6 fatty acid (FA) families. Current interest is devoted to the so called fish oils containing a high share of n-3 FA (eicosapentanoic acid [EPA] and docosahexaenoic acid (DHA)]. It is claimed that these particular FA exert a positive effect on the development of cardiovascular and inflammatory diseases and the beneficial effects of fish oil supplementation in many other chronic diseases have been advocated. Many recent observations suggest a potential role of fish oils in the treatment of atopic dermatitis and psoriasis. There are also indications that premature infants have limited dietary support of the n-3 FA required for normal composition of brain and retinal lipids.

**Nutraceuticals in Ayurveda**

The Acharyas of ancient Indian codified systems of medicine namely Ayurveda and Siddha seemed to have an in depth knowledge and understanding about the delicate relationship between food, nutrition and health. They also had a clear understanding of the delicate cellular mechanisms of the body and the deterioration of the functional capacity of human beings. These ancient medical masters had developed certain dietary and therapeutic measures to arrest/delay ageing and rejuvenating whole functional dynamics of the body system. This revitalization and rejuvenation is known as the 'Rasayan Chikitsa' (Rejuvenation therapy) in Ayurveda. It is specifically adopted to increase the power of resistance to disease (enhance immunity) and improve the general vitiation and efficiency of the human being. 'Rasayana' therapy is done for a particular period of time with strict regimen on diet and conduct. Rasayana drugs are very rich in powerful antioxidants, hepatoprotective agents and immunomodulators. Rasayana is one of the eight clinical specialties of the Indian classical Ayurveda, aimed for the rejuvenation and geriatric care. Rasayana is not a drug therapy, but is a specialized procedure practiced in the form of rejuvenation recipes, dietary regimen (Ahara Rasayana) and special health promoting conduct and behavior ie. 'Achara rasayana'. Sushruta while defining rasayana therapy says that it arrests ageing ('Vayasthapam'), increase life span ('Ayushkaram'), intelligence ('Medha') and strength ('Bala') and thereby enable one to prevent disease. There are over 30-35 medicinal plants mentioned in different treatise of Ayurveda and Siddha having rasayana properties. The important among them are *Sida cordifolia, S. cordata, Abutilon indicum, Tinospora cordifolia,*

*Acorus calamus, Ocimum sanctum, Withania somnifera, Emblica officinalis, Asparagus racemosus, Piper longum, Commiphora mukul, Semicarpus anacardium, Centella asiatica, Curcuma longa Chlorophytum borivilianum, Chlorophytum tuberosum* and *Dactylorhiza hatagirea* etc.

In 'Ayurveda' the term 'Rasayana' therapy thus refers to the use of plants or their extracts as rejuvenators or as an elixir to enhance longevity, to improve memory, intelligence, good health, promote youthfulness, improve the texture and luster of the skin/body, improve the complexion and voice, promote optimum strength of the body and sense organs. Rasayana materials can be special foods/nutritional items, medicinal herbs or a combination of all these three. Thus the use of the medicinal plants as a source of dietary supplement or as a nutraceutical is well documented for centuries.

Ayurveda considers that an individual with advancing age accumulates waste and toxic substances and declines in vitality and loss of resistance/immunity;

- '**Dhatu Kshaya'** weakening of the functional dynamics of the cell or tissue system of the body.
- '**Ojas**' the state of excellent health expressed in general strength, vitality and luster of the individual – with 'Bala' ( immunity against diseases).
- **'Dhatuvridhi'** i.e. rejuvenation of the whole tissue system is done by 'Ojasvardhaka Dravyas'- the substance that improves the functional efficiency and immunity of the individual. This therapeutic process is known as 'Rasayana Chikitsa' – Rejuvenation therapy.

The ancient Ayurvedic physicians treated every individual as unique. According to them, normally there cannot be two individuals with same constitutional nature. That they referred as 'Prakruti' and therefore, the treatment is prescribed only after diagnosing the constitutional nature of the individual. This constitutional nature of the individual is based on the 'Tridosha' philosophy. The various permutation- combination of the 'dosha' in conjunction with 'triguna'- the qualitative nature could offer countless variation in the constitutional nature of the individual and an experienced physician can very well diagnose it. Interestingly, the modern molecular geneticists also now speak a language similar to this i.e., genomic composition – i.e., DNA finger print is unique to an individual and we are now talking about gene profiling to understand

the genetic predisposition and then suggest treatment to correct it, either by proteomic therapy or using other substances that can alleviate the defects or even the genomic therapy- proteomics, metabolomics and genomic methods for correcting disorders or treating diseases and nutrigenomics, genetically designed nutrition or food items. The ancient Ayurvedic masters had advised to consume specific food that suit to the constitutional nature of the individual whom they have categorized in to seven major groups. They have insisted certain dos and don'ts with regard to food and nutrition according to the constitutional nature of the individual (Prakruti). Modern molecular biology and genetic engineering is offering genetically modified nutrition/food that suit to the constitutional/genomic background of the individual or designer drug suited to the individual – known as Nutri genomics and pharmacogenomics respectively. With the perfection of technology of mapping the human genome, it is now possible to get the DNA profile of individuals and then develop customized nutrition and treatment regimen.

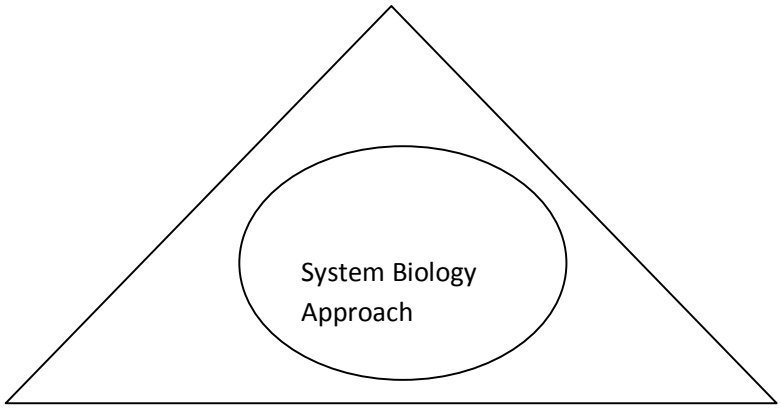
Pharmacogenomics is the study of the hereditary basis for differences in response of populations to a drug (Patwardhan etal, 2004). The same view was expressed by the ancient Ayurvedic master Charaka, some 4000 years ago. Charaka observed that 'Every individual is different from another and hence should be considered as a different entity. As many variations are there in the universe, all are seen in human beings. Patwardhan (2003) referred it as the Ayugenomics and explained that it has quite clear similarities with the pharmacogenomics that is expected to become the basis of designer medicine.

An "in-depth study and analysis" of the constitutional concept of Ayurveda namely 'Prakruti' with that of the modern genotype will yield highly valuable insight in understanding the functional dynamics of the human health and can lead to the development of a customized treatment regimen. Less than 20%of the plant species have been evaluated chemically or biologically (Cordell, 2003). Approximately 21,200 alkaloids have been isolated and described out of which hardly 70% have been evaluated in a single bioassay. Out of about 5000 compounds which enter advanced pharmacological development only one will become a drug. (Cordell, 2005). It is also now a well established fact that drug discovery for a single entity drug is an inefficient and extremely expensive process and the best choice is to develop phytomedicine or pharmacomedicine which involve activity guided isolation of fractions of selected traditional polyherbal formulations and their various permutation combinations. This way one could develop effective therapeutic remedies gaining increasing acceptance and

popularity. Such an approach could lead to the development of evidence based herbal formulations. Automotion and application of nanotechnology, proteomics and metabolomics may further advance nutraceutical research and development.

A review of some exemplary evidence based research and approaches now resulted in wider acceptance of Ayurvedic medicine (Vaidya, 2002, Vaidya et.al, 2003). National Botanical Research Institute jointly with Deenadayal Research Institute, Chithrakoot organized a national workshop in 2003 that led to the development of a 'Golden Triangle' approach (Mashelker 2003). 'Golden Triangle' refers to the converging of Ayurveda, modern medicine and modern sciences to form a real discovery engine (Fig. 1) that can result in newer, safer, cheaper and effective therapies.

Ayurveda (Traditional wisdom)




Modern Sciences
(Technological advances)

Modern medicine
(Evidence based clinical trials/practices)

(Golden Triangle, Mashelkar 2003)

New technologies are constantly being developed to isolate and identify the components responsible for the activity of these plants. But these technologies should consider and possibly use the fact that the biological activity of plant extracts often results from additive or synergistic

effects of its components. Another possibility is the qualitative and quantitative variations in the content of bioactive phytochemicals, which are currently considered major detriments in its use as a medicine. Different stresses, locations, climates, microenvironments and physical and chemical stimuli, often called elicitors; qualitatively and quantitatively alter the content of bioactive secondary metabolites. Enzymatic pathways leading to the synthesis of these phytochemicals are highly inducible (Ebel and Costa, 1994). This is particularly true for phytochemicals that are well documented for their pharmacological activity, such as alkaloids (Facchini, 2001), phenylpropanoids (Dixon and Palva, 1995) and terpenoids (Trapp and Croteau, 2001) whose levels often increase by two to three orders of magnitude following stress or elicitation (Darvill and Albershelm, 1984). Thus, elicitation-induced, reproducible increases in bioactive molecules, which might otherwise be undetected in screens, should significantly improve reliability and efficiency of plant extracts in drug discovery while at the same time preserving wild species and their habitats. Molecular biologists and genetic engineers are currently engaged in designing food and medicinal plants with desired genetic make up so as to make custom made nutritional composition food or therapeutically desirable agents in plants – known as nutrigenomics and pharmacogenomics or proteomic approach to healthcare. Another emerging research area in medicinal plants is the metabolomics and system biology. Metabolomics is considered as a key technology in the system biology approach to study the mode of action in the therapeutic activity of traditional medicine and medicinal plants (Roos et al, 2004; Rao etal, 2004 and Mei Wang et al 2005). By measuring the activity of living organisms (which can be anything from a cell culture, animals to patients) for extracts with different composition, possibly one may identify a compound or a combination of compounds that correlate with the activity. This system biology approach is a major challenge for the coming years in studying medicinal plants (Verpoorte et.al., 2005)

**India showed the way**

It was India who has shown to the world that it is possible to revoke patents secured by developed countries (particularly USA), based on the indigenous biodiversity and traditional knowledge of the developing countries (Mashelkar, 2001). The case of Ayahuausca in Brazil, neem and turmeric in India are classic examples. But challenging and revoking patents are expensive and time consuming which many of the poor developing nations cannot afford. The

Indian Biological Diversity Act, Costa Rican Biodiversity Law, Philippines EO247, Brazilian Bill of Access to Genetic Resources, Andean Community's Common System on Access to Genetic Resources, AU Draft legislation on Community Rights & Access to Biological Resources, JNTBGRI/Pushpangadan's Model of Benefit sharing (Pushpangadan, 2002, 2008) are some of the laws, policy framework and experimental models developed by the LMCC nations to protect genetic resources and associated TK.

**Plants and the Insect flora**

While in food plants our main interest is the carbohydrate / sugars, proteins, fats and other vitamins, in medicinal plants we look for therapeutically useful chemicals which are generally termed as secondary metabolites which are not that essential for the normal growth and development of the plants/organisms. The plants synthesize these compounds to protect themselves i.e. to adjust, adapt or defend/offend from the hostile organisms or diseases or the environment. Secondary metabolites useful in medicine are mostly polyphenols, alkaloids, glycosides, terpenes, flavonoids, coumarins, tannins, etc. The production of secondary metabolites although controlled by genes, their specific expression is greatly influenced by various factors including biotic and abiotic environment such as climate and edaphic factors or other associated living organisms. Plants are firmly fixed in soil. They cannot run away when confronted by hostile environment or by diseases, pests and predators. During the course of evolution plants have evolved various physical and chemical mechanism to defend and protect themselves from the vagaries of nature (drought, heat, rain, flood, etc.) and also to defend or offend the predators or to protect from predators and pathogens. The most successful adaptation of plants while developing various physiological mechanisms was the production of a variety of phytochemicals by which they were able to face both biotic and abiotic stresses/threats. In this process of defense / offence from abiotic stress or the invading disease causing organisms or the predators (animals, birds, insects and herbivorous animals), the plants synthesize a variety of chemical compounds.

Apparently plants produce many antioxidants for protecting themselves from the oxidative stress. These compounds are in general stored in the leaves for other parts like leaf, bark, hardwood or fruits, etc., so that the predators or the disease causing organisms can be either knocked down or paralyzes or even got killed. In many cases of plants, the production of the

secondary metabolites also depends on the association of other living organisms, more particularly, the plants or soil microbes. Such differential expression of therapeutically active principles in plant on account of the above said factors appears to have been known and well understood by the ancient Ayurvedic Masters, when they gave specific instructions in the procurement of medicinal plants. The classical texts of Ayurveda and Siddha give detailed directions with various dos and don'ts in collection and processing of medicinal plants. They insisted collecting certain medicinal plants in certain specific seasons from specific ecosystems and also during certain particular stage of growth and development of the plants.

**Cross pollination increases genetic diversity**

There is increasing evidence to show that the varieties, ecosystems and stage of plant growth development etc. influence the production of secondary metabolism in many medicinal plants. Almost 35 to 40% of the medicinal plants found in tropical regions are cross-pollinated species and there exists extensive genetic variability particularly, in the secondary metabolites in these species. Therefore, in a given population of a medicinal plant species there may be many plants, which may not have the desired therapeutically active constituents and may only a few of them have the desired therapeutically desirable constituents. There used to be highly experienced medicinal plants collectors ('Bhishagwaras') in the past who were able to identify such plants and collect them. It is believed that the plant collectors of the Samhita period possessed even some kind of intuitive knowledge, so that they were able to pick up the right plants from a population of a species having variations in their therapeutic contents. It is even stated in certain classical texts of Ayurveda that those few plants having the therapeutic property in a large population would speak to those well-experienced medicinal plant collectors with intuitive knowledge that "I am the one who has the therapeutic ability and therefore collect me". We don't have now such intuitive persons who can understand the language of plants! What we have today is the scientific expertise with sophisticated analytical tools. We have to use them appropriately.

**Co-evolution and Co-adaption of insect fauna and flora**

We know now that the presence of or absence of certain secondary metabolites in medicinal plants are influenced by a variety of factors, which includes climate / season, edaphic conditions or the association of other plants and other living organisms. Another factor that

influenced the production of secondary metabolites in plants are the inter relationship between plants and the insect flora. It is now generally accepted that the flora and the insect flora in a tropical ecosystem have been co-evolving and co-adopting. Many of the medicinal plants are cross-pollinated and they need the help of pollinators. In an open area the wind could do the function, but in a canopied forest many of the shrubs and herbs growing under the big trees cannot get wind to pollinate. These plants are thus heavily depending upon the insects or even the birds to pollinate them. To attract the insects or birds the plants develop pleasant aroma (essential oils) and provide honey and pollen as food to these pollinator. Many flowers contain honey or pollen, which are the normal food of many insects and birds. The insects like bees and butterflies visit flowers after flowers, and take honey or pollen both. During this process they also carries pollen on their body part, which then help in pollinating while visiting other plants. Many flowers have structurally evolved flower parts to effect such pollinations by insects. These insects also multiply on plants. They lays millions of eggs and the larva that emerge from these eggs then feed on leaves of the plants, sometimes destroying the plants altogether by over feeding. During the course of evolution the plants began to synthesize certain toxic substance so that a good percentage of the feeding larva could be killed. The insect on the other hand began to develop resistance so that many of larvas could survive. The plants on the other hand again counteracted it synthesizing more and more toxic compounds. This was something like the love and hate relationship between plants and the insects, which during the course of millions of years of evolutions have resulted in the synthesis of innumerable chemical compounds, mostly the secondary metabolites in plants as well as in insects. The variability in living organisms is indeed the insurance for survival.

The evolutionary origin of cross breeding was indeed a nature's device for reshuffling of genes so that new variants could be produced. Similarly, the abiotic conditions also exerted certain influence in the plants and the plants responded by developing various chemicals. In extreme drought conditions the desert exert a kind of stress on the plants and the plants evolve by synthesizing chemicals that would help them to protect from stress induced by the desert conditions an excellent example for this is the plant *Commiphora wightii*; an important medicinal plants used extensively in Ayurveda, Siddha and even Unani under the name 'Guggul'. The medicinal part of the plant is the gum exudates from the stem bark of living plants. This gum is traditionally collected from the desert regions of Rajasthan, Gujarat and even Afghanistan.

When the author joined as Director of Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) he found this plant growing luxuriantly at JNTBGRI garden. Out of curiosity the author collected gum from this plant and sent for chemical analysis. To everyone surprise the chemical data of this gum revealed that it do not contain most of the alkaloids. A logical explanation that one can offer is like the following: This plant growing in JNTBGRI botanic garden is located in a warm humid tropical forest region. It has no desert like conditions and therefore there is no question of any drought induced stress. The same plant when growing in desert has to confront drought-induced stress and the plant synthesizes the stress beating chemicals. There are many similar cases that demonstrate that certain specific climatic conditions and edaphic situations are extremely important in the production of therapeutically desirable medicinal compounds. Sandalwood is another classical example. The specific aroma of sandalwood is due to the presence of certain essential oil, chemicals, mostly monoterpenes and sesquiterpenes. The productions of the specific aroma chemical are fully expressed only in those sandalwood trees that grow in certain forest regions of Karnataka. The sandalwood growing in other places in India or elsewhere in the world do not have the same kind of aroma with the corresponding chemical constituents.

**The advancement of molecular biology**

With the advancement in modern technology particularly, molecular biology, genetic engineering, it is possible to take the genetic profile of the individual and based on which it is possible to prescribe the right kind of food particularly, the protein so that many diseases could be prevented. The concept of functional food, medicinal food and nutraceuticals reflect this concept and practice of Ayurveda. Genetic engineers are now planning to develop 'Nutrigenomics' and 'Pharmacogenomics'. We, therefore, have think to integrate it with Ayurvedic constitutional concept and develop an 'Ayugenomics'. India has an excellent opportunity in this new scenario. We have a rich heritage of the Indian System of Medicine like Ayurveda, Siddha and Unanai. Today we find many theories of pathology of diseases and curative principles of modern medicine are crumbling down and now an all pervasive antioxidant theory is strongly emerging. It is now said that you can maintain an excellent health and lead a productive long life free from any disease, if you can get rid of the oxygen radicals from your body. It is now understood that most of the diseases are due to the reactive oxidant radicals. Oxygen as we know is the life gas, ('Prana Vayu') without which one cannot live. One needs to

know and understand the atomic nature and functional dynamics of the atom oxygen to understand clearly the antioxidant theory of modern medicine.

The decoding and sequencing of human genome has resulted in gene profiling and understanding the gene functioning and its product which is always a protein leading to the development of genomic or proteomic therapy. There is also leading to the development of nutrigenomics, pharmacogenomics in modern medicine. The Ayurvedic individualized approach in diagnosis and treatment now find acceptance in modern medicine. It is now believed that one could take his/her genomic profile and identify the defective genes which in future could be replaced by genomic therapy or provide the product of gene, i.e. the protein i.e. proteomic therapy or undertake a metabolic engineering.

Integration of modern science and technology with ISM do not mean to blindly adopt the parameters of western medicine. The conceptual and theoretical foundation and basic philosophy of Ayurveda is very strong and sound. Therefore, Ayurveda can firmly stand on its own theory and philosophy. What is required to be done is to imbibe the fast growing science and technology to upgrade and fine-tune the system with the intervention of modern science and technology. All the scientific knowledge, tools and technology developed in modern science should be carefully examined and judiciously adopted to suit the concept and practice of Ayurveda. Blind adoption of modern methods has led Ayurveda in a chaotic situation. For example, adoption of the modern Binomial Nomenclature of- the naming of a plant with Binomial Nomenclature has indeed helped in systematically organizing the living organisms. But it is an artificial method and has no functional taxonomy. The genus name and species name has absolutely no meaning, whereas the Ayurvedic taxonomy do not end with one name alone. In addition to the name it provides the habitat of the species and season or developmental stage etc. for collecting it. When you put all these informations together one is able to collect the right medicinal plant form the right place (ecosystem) and at the right time. Medicinal plants collected in such a manner will have the desired therapeutically active compound(s). The modern taxonomic Binomial Nomenclature does not give any such functional details or accurate information of the particular plant species. Therefore, it is extremely important for Ayurvedic experts to develop an appropriate classification, identification of the right medicinal plant using the Ayurvedic taxonomy along with the modern taxonomy and the additional chemical and

molecular marker tools so that one could arrive at the right decision on the collection of medicinal plant. We need to prepare something like a passport data of medicinal plants, which provide the Binomial Nomenclature and other further functional details like the climate, edaphic situations or the stage of growth and development of the plants etc. and the chemical and molecular details. After collecting such plants it may be again subjected to biological evaluation so that one could fix and develop the reference sample for that particular medicinal plant species. Such a detailed monographic account of the plant is known as the Passport description of the plant, just like the passport that we hold with which , one can be traced back to his home. Such passport data may go a long way in ensuring the sovereign rights of our bioresources and also will help in preventing any possible biopiracy.

Thus a combination of Traditional wisdom and modern scientific knowledge and technology will help in developing therapeutically potential and cost effective drugs from our bioresources which would help in combating the new and emerging diseases that pervade mankind.

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# Herbal Medicine and Indigenous Health PracticesAmong the Koyas of Khammam District.

Dr.S.Rama Mohana Rao {Department of Botany: SR&BGNR GDC)

G.Ravi (Research Assistant: SR&BGNR GDC)

Email id: Samineni.rao@gmail.com

Ethno botanical studies related to tribal medicine or Ethnomedicine have identified some 45,000 plant species which are available to 550 Indian Tribal communities belonging to 160 linguistic groups inhabiting In varied geographical and climatical zones.The present survey conducted at Bhadrachalam & Chintoor areas reg the traditional Knowledge & wisdom of koya Community revealed that how they are applying the local ambient flora for curing their Diseases.The koyas of Chintoor and its neighbouring hamlets in the agency area, have their own institutional mechanisms.

1) Perceive health problems
2) Protect and promote health
3) Prevent and treat illness
4) Provide care to the sick.

Illness , a common and widespread phenomenon prevailing among the koyas is not only a personal affair.It arises a wide variety of feelings in the sick which makes him to search for treatment as an immediate problem and choices and alternatives for curing diseases are considered among the koyas within their socio – cultural frame work i.e the existing knowledge and Experience of the koyas in relation to identification and curing of Diseases.The traditional mode of koya medical system involves the following persons

**Traditional**

| | | | | |
|---|---|---|---|---|
| Herbalist | Vejjollu | Devarlu | Patels | Pujaries |
| Or | Or | Or | Or | Or |
| Medicine | Sorcerers | Witches | Tribal heads | priests |

In the initial stage, the koyas use Home remedies to cure Certain illness and other minor aliments .It they fail to cure these illnesses by using the home remedies ,they to consult the traditional herbalist available at their locality or neighbouring villages.Herbalist or Medicine man is considered as a healer. The work of the herbalist or medicine man involves of the task of restoring bodily health to any person affected with some illness. This consists of treatment of the sick in such a way that all the parts of his body regain the form and function, which he had before illness. This restoration of health is a much desired goal of medicine-man or herbalist.

Generally herbalists among the Koyas use several roots, herbs, leaves and barks of various plants, and other foods having medicinal values. In general Herbalist or Medicine-man treats all kinds of illness, but some are specialized in specific illness. The herbalists or Medicine-man specially cultivates a few plants in their respective kitchen gardens. Many of the herbalists interviewed were , initially the successors of their parents, and a few were patients, who after being cured, learned the therapy from their herbalists after paying a certain sum of money. The Medicine- man or herbalist mixes the plant remedies into paste or in the form of pills(matralu), so that they cannot be recognized. Medicinal plants used in curing of diseases must be collected in the morning and evening. Bark of the medicinal plants are removed in the sunlight. The following plant parts are used to cure various diseases by the Koya tribe.

Table :-1 plants and their specific parts commonly used in Ethno Medicine

| **Vernacular name** | **Botanical name** | **and Usable part** |
|---|---|---|
| Adavi donda chettu | Solena amplericaulis | leaves |
| Adavi benda chettu | Hibiscus lampa | Roots |
| Adavi nimma chettu | Pleispermum alatum | Fruits |
| Balka chettu | Ridella montana | leaves |
| Billudu chettu | Chloroxylon swietenia | Roots and leaves |
| Bugga jilledu chettu | Celtis orientalis | Milk and bark |
| Chedu kakara chettu | Momordica Charantia | leaves |
| Chedu anapa chettu | Cucurbita maxima | Leaves |
| Danimma chettu | Punica granatum | Fruits |

| | | |
|---|---|---|
| Durada chettu | Mucuna prurita | Seeds |
| Giritonda chettu | Antidesma ghaesembilla | Root |
| Golugu chettu | Glycosmis raborea | Leaf |
| Jitty chettu | Demia extensa | Root |
| Ganneru chettu | Neerium indicum | Leaf |
| Maredu chettu | Aegle marmelos | Bark |
| Maddi chettu | Terminalia alata | Bark |
| Medi chettu | Ficus virgate | Leaves and roots |
| Moori chettu | Buchnania latifolia | Leaves |
| Nalla visiri | Clitoria ternata | Leaves and barks |

| | | |
|---|---|---|
| Nela tangedu | Cassia kleinii | Leaves and barks |
| Nela tadi chettu | Myrobalnus bellerica | Fruits |
| Rathna purusha chettu | Hybanthus ennespermus | Leaves |
| Rela chettu | Cassia fistula | Bark |
| Some chettu | Panicum colonum | Root |
| Tippa teega | Tinospora cordifolia | Root,Leaf |
| Ummetta chettu | Datura metel | Bark, Roots& leaves. |

Pounding the plant or plant parts into a paste or the extract or squeezing the liquid and fermentation are common practices among the koyas. Pounded products are generally administered directly in the form of pills. For Rheumatic swellings either boiled roots, barks, leaves or the paste of the plant part is applied. Dry plant parts are usually made into powder. In certain cases Barks or Roots of medicinal plants are chewed and sucked.

Generally Koyas takes the medicine either with fresh cold drinking water or with their traditional liquor, or with honey as advised by the medicine –man. Several of koya medicines are

prepared in combination with black pepper. Some of the following diseases are cured by the koya community by adopting the following treatment methods.

**Treatment of Diseases:-**

**Rompa/Padisam/Jalubu (cold)**

Treatment :- The medicine is a combination of Nimma chettu leaves, cheppu chettu leaves, vavila chettu leaves, and a little bit of turmeric powder boiled together in a vessel. Inhalation of this steam three to four times a day gives complete relief from colds.

**Daggu (cough)** :--

Treatment :- The rasam extracted from Karakkaya is given internally twice or thrice a day until the cough is controlled.They may eat the curry of "Vakudukayalu" for controlling continous cough.

**Headache (Tala Noppi);-**

**Treatment :- To contol Headache, the koyas collect Allicheemalu from the forest and crush them and tie them in a cloth. The patient is made to inhale the crushed ants tied in the cloth and the treatment gives relief from the headache.**

**Treatment 2;- The paste of sonti (Dried ginger) is applied to the temples(kanathalu) . The patient gets relief within 10 minutes.**

**Jvaram ( Fever) ;-**

**Treatment ;- To control fever, the pills made out of the paste of the Nela vemu leaves and Nela tadi tubers are given for two or three days or until the fever is controlled. During the period of treatment the patient will also be given gruel (java) made of jowar.**

**Kalla Kalaka :-**

**Treatment :- To cure the eyes are wiped with drops of water falling from the leaves of Aamudamu plant(Ricinus communis) for four or five days.**

**Then the Medicine-man makes an extract from vempala and balla kayala plant and pours two or three drops of this rasam in the eyes of affected person for three or four days or until it is completely cured.**

**Vantulu :-**

**Treatment :- The paste made out of Nela usiri plant leaves is used to control the vomiting. The koyas also drink the rasam made out of Danimma fruit or smell the juice of Velaga plant leaves.**

**Nadumu noppulu :(Back ache)**

**Treatment:- The koyas apply the rasam made out of Nela-tangedi and Nela usiri plants externally, on the pain affected part of the body for two or three days to cure Nadumu noppulu.**

**SKIN DISEASES:**

**Durada ( Itching):-**

**A paste made out of the leaves of vepa( Melia azadirachta) and Turmeric powder is applied externally on the effected part of the skin at least for one week.**

**Gajji pokkulu (scabies):-**

**The powder of Kanuga seeds mixed with coconut oil is applied externally on the affected part of the skin, at least for one week.**

**Tamara (ring worm);-**

**The Rasam made out of the leaves of Tammara plant mixed with lemon juice is applied externally on the affected part of the skin at least for one week or longer till the skin disease is cured.**

**Wounds :-**

**To cure this Discease Rasam made out of the leaves of Maredu plant is applied externally on the affected part of the skin for two or three days.**

**Patcha kamerlu (jaundice)**

**The koyas eat food with milk , mixed with the paste made of Vellulli (garlic) and the tubers of Jitti plant at least for five to six days to cure Patcha kamerlu.**

**Ubbu Kamerlu:-**

**To treat Ubbu Kamerlu , the affected person eats some chedu kakarakayalu for four to five days. In addition the paste made out of the barks of kanuga tree is applied externally on the patients body for atleast five or six days.**

**Palmu katu (Snake Bite):-**

**The koyas use Pamu rallu (snake stones) to neutralize the poison due to snake bites. Two types of snake bites are available to the koyas 1) pedda pamu rai which is taken from the head of pinjaiv and 2) china pamu rai which is taken from Nagu pamu(cobra) head. The koya medicine-man keeps pamurallu , on the snake bitten spot for a few minutes.**

**After absorbing the poison, these snake stones will fall down from the snake bitten spot. Mean while the medicine man makes a rasam out of the tubers of Tella Eswari and Nalla Eswari Plants and roots of Putta Veduru Plant, puts two or three drops of the juice in the eyes of the snake bitten person. After some time the affected person will become normal. The koyas stated that the person bitten by snakes can not identify the taste of Neem leaves.**

**The above treatments made by the Koya community of Khammam District is revealed to the research team,visited to their villages for identifying the Ethano-Medicinal Plants.**

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# WONDER PLANTS (Bhalae chetlu)

Dr.Ch.Ramesh Babu (Lecturer in Botany

Govt.Degree College for Women,Khammam,

Dr.S.Rama Mohana Rao(Lecturer in Botany)

*SR&BGNR Govt.Degree & PG.College Khammam*

Plants are nature's finest organic chemists, producing more than 200 thousand small molecules many of which being secondary metabolites are also useful as medicinal compounds.

The world health organization has been promoting the concept that we must save plants to save lives. The health for all, Objectives can be achieved only by integrating Ayurvedic and herbal medicine with allopathic Treatments. It is heartening to note that our country possess about 8% of the estimated biodiversity of the world with approximately 8000 medicinal plant species from the flowering plants available in the world. Various organization in the country have got a critical role to play in the conservation, propagation and cultivation of medicinal plants.

National Medicinal Plants Board is involved in a big way in situ and ex situ Conservation. To promote this objective the A.P State Forest Department in Collaboration with ITDA carried out a scheme such as "Revitalization of Medicinal Plants."

I along with other associates extensively toured Chintoor, Mothugudem, Tuligonda, Nakkavaram etc., agency areas which are hot spots for medicinal plants and made Ethno

botanical survey, Traditional Medical practices and enumerated the plants with the assistance of traditional practitioners.

**Methodology**: Ethno botanical survey was carried out in Bhadrachalam revenue division the survey approach was both interactive and interview based local traditional healers, tribal people, and rural folk were consulted regarding the dosages and preparation of medicine,and the herbarium was prepared , after identifying the plant species with the help of local floras and gamble volumes. The voucher specimen were deposited in Kakatiya University Warangal. Estimation of the plant species was done according the Benthom & Hooker Classification. The plant Name,the plant part used and usage for ailments are listed below.

| S.No | Plant name | Family | Vernacular name | Plant part | Ailment/ Therapeuticactivity |
|---|---|---|---|---|---|
| 1 | Aerva lanata | Amaranthaceae | Pindikura | Root/whole | Kidney stone problems |
| 2 | Cissampelos pariaira | Convolvulaceae | Adavibanka theega | Root | Prevent Urinary Disorders & Diabetes |
| 3 | Cocculus hirsutus | Minispermaceae | Katla theega | Root & leaf | Root- Dyspepsia<br>Leaf- Eczama syphilis |
| 4 | Tinospora cordifolia | Menispermaceae | Tippa theega | Whole Plant | Digestive problems<br>Diarrhoea |
| 5 | Argemon mexicana | Papavaraceae | Brahma dandi | Yellow latex | Scabies Leprosy, Scorpian sting. |
| 6 | Capparis zeylanica | Capparidaceae | Adonda | Root bark | Stomache,piles |
| 7 | Crataeva magna | Capparidaceae | Ulimiri chettu | Root bark leaf | Headache<br>Cardiac diseases ,Diabetes |
| 8 | Hybanthus enneaspermus | Violaceae | Ratna purusha | Root/Whole plant | Leucorrhoea |
| 9 | Bixa oerallana | Bixaceae | Jaabara kaya | Root leaf | Snake Bite, Anti periodic |

| | | | | | |
|---|---|---|---|---|---|
| | | | chettu | seed | Cancer |
| 10 | Scolopia crenata | Flacourtiaceae | Adavi jonna | Bark, Leaf, flower | Diuretic, Snake Bite, Eye diseases |
| 11 | Talinum portulaci-folium | Portulaceae | Peddapappu kooraku | leaf | Diabetes, Mouth Ulcers,Aprodisiac |
| 12 | Abelmoschus moschatus | Malvaceae | Adavi kasturi | Root | Venerial diseases<br>Skin disorder |
| 13 | Decaschistia crotonifolia | Malvaceae | Kondagogu | leaf | Hydrocele |
| 14 | Kydia calycina | Malvaceae | Kondapatti | leaf | Body pains, Saliva Deficiency |
| 15 | Thespesia Lampas | Malvaceae | Papidichettu | Root | Goenorrhoea, syphilis |
| 16 | Pterospermum xylocarpum | Sterculiaceae | Lolugu chettu | flower | Headache |
| 17 | Aegle marmelos | Rutaceae | Maredu | Whole plant | Veneral diseases, digestive disorders |
| 18 | Murraya Paniculata | Rutaceae | Pulavelagu | Root bark | Snake bite |
| 19 | Balanoites aegyptiaca | Balanitaceae | Gara | Stembark | Leprosy |
| 20 | Chloroxylan swietenia | Flindarsiaceae | Billudu | Leaf | Rheumatism, wounds |
| 21 | Maytenus emarginata | Celastraceae | Danti | Stem bark | Gastro intestinal disorders. |
| 22 | Cissus quadrangularis | Vitaceae | Nalleru | Root & stem | Bone fraction Abdominal disorders Dysentery. |
| 23 | Cardiospermum halicacabum | Sapindaceae | Budda theega | Root | Diabetes,Diaphoretic, Rheumatism, Nerve disorders |

| | | | | | |
|---|---|---|---|---|---|
| 24 | Psoralea corylifolia | Fabaceae | Bavanchalu | Seed | Laxative,Aphrodisiac,psoriasis |
| 25 | Madhuca longifolia | Sapotaceae | Sanna Ippa | flower | Polyurea, leprosy,scorpion sting |
| 26 | Terminalia chebula | Combretaceae | Karakaya | Fruit | Breast Cancer |
| 27 | Plumbago zeylanica | Plumbaginaceae | Chitramoolam | Leaf Powder | Joint pains,Leprosy Typhoid |
| 28 | Hygrophila auriculata | Acanthaceae | Neerugobbi | Leaf Powder | Leucoderma(Bolli) |
| 29 | Strychnos nuxvomica | Logniaceae | Musti | Bark powder | Snake bite,back pain |
| 30 | Ficus racemosa | Moraceae | Medichettu | Bark powder | Urinary Trouble,inflamation |
| 31 | Vitex nigundo | Verbinaceae | Vavili | Leaf powder | Joint pains,Goitre,Fits. |
| 32 | Dichrostachys cinerea | Mimosaceae | Veluturu | Barkpowder | Prevents over bleeding during menstrual cycle. |
| 33 | Hemedesmus indicus | Periplocaceae | Sugandhapala | Root & leaf Stem extract | Blood Purification |
| 34 | Centella aciatica | Apiaceae | Saraswathia-aku | Chewing of leaves | Neurosis, stammering |
| 35 | Bauhinia vahli | Caesalpinaceae | Addatheega | Root powder applying paste on back bone | Promote labour pains during delivery |
| 36 | Emblica officinalis | Euphorbiaceae | Vusiri | Fruit | -indigestion,anemia, white discharge |

| | | | | | |
|---|---|---|---|---|---|
| 37 | Pterocarpus marsupium | Fabaceae | Eagisa | Stem powder juice | Diabetes |
| 38 | Aristalochia indica | Aristolochiaceae | Easwari | Root powder | Skin diseases,anti toxicant |

**Discussion & Conclusion:** The Ethno botanical survey was basically focused on ethno medicine 38 Angiospermic families were estimated for cure for different ailments And the therapeutic effect was Skin, Snake bite, Digestive disorders, Cardiac problems as well as Aphrodisiac. Faced out from various plant parts include leaf, Flower, Fruit, Seeds & Bark.

As the traditional medicinal base is fast disappearing, there is a need for documentation of indigenous knowledge. In this connection Ethno botanical survey not only gives an insight into the ethnic medicine, ethnic culture of the study but also about biodiversity of the age old traditions and yet the efficacy of the crude drug should be scientifically Analysed for the benefit of mankind. As the study is directed towards identifying the medicinal plants, their potential in therapeutic use, will certainly prove the way for the discovery of new drugs for the future generation. It can be Concluded that Preservation (Culture) and Conservation (Biodiversity) are the need of the hour.

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# ENDANGERED TREATMENT OF TRADITIONAL MEDICINAL AMPHEBIAN PLANTS (BRYOPHYTES)

**AJAYKUMAR PALIWAL*, M.ARJUN**N.VENU MADHAV***, E.N.MURTHY ***, M.ARUNA****

**DEPARTMENT OF BOTANY,TELANGANA UNIVERSITY,NIZAMABAD, A.P**

****E.mail:arjunmallaram@gmail.com**

**Department of Botany, Telangana University, Nizamabad.**

***Department of Botany, Higher Education, Bageshwar, Uttaranchal, India.**

****Department of Botany, Satavahana University, Karimnagar-505001**

ABSTRACT

Paper deals with the study of local amphibian plants flora, and application in curing diseases for human welfare. Already it has been proved that the liver worts and other bryophytes are used as a medicine to cure many human diseases and disorders at Himalayan regions of India. Due to the present environmental conditions are not supporting for existence of bryophytes. This early land plants love to exist in pure environment, with water source and moist shady places,

Mosses, liverworts, and hornworts belong to a division of the Plant Kingdom known as Bryophyta – the bryophytes. Morphologically, bryophytes are usually small organisms, typically green and lacking some of the complex structures found in vascular plants. They do not produce flowers or seeds, and the majority has no internal mechanism for transporting water or nutrients. Although they have no roots they do have root-like structures for anchoring and water absorption.

In ancient times bryophytes have been used as herbal medicines in various parts of the world.. During the middle ages, the large thallose liverworts Mere interpreted according to the Doctrine of Signatures. The decoction of liverworts was supposed to be effective in the treatment of

disorders of liver, and that of the "hairy-cap moss" to beautify ladiks hairs. In Polytrichum **juniperinum** is still used

***Keywords*** - ethnobotany, morphology, bryophytes, taxonomic treatment, floristic, ethnic uses

## INTRODUCTION:

Mt. Kitanglad exhibited seventeen (17) species of medicinal bryophytes. Of these, eleven (11) are mosses belonging to seven (7) families in eleven (11) genera and six (6) liverworts belonging to five (5) families in six (6) genera. Mt. Kalatungan exhibited fourteen belonging to six (6) families in eight (8) genera and six (6) liverworts belonging to five (5) families in six (6) genera. The moss species with medicinal properties belongs to the genera ***Sphagnum, Polytrichum, Rhodobryum, Fissidens, Bryum, Mnium, Dawsonia, Philonotis, Pogonatum, Barbula*** **and** ***Plagiomnium*****.** The liverworts species include ***Marchantia, Pallavicinia, Herbertus, Riccardia, Dumortiera*** **and*****Plagiochila*****.** The species under study exhibited antimicrobial activity, anti-tumor, anti-cancer, antileukemic activity and healing effects based from secondary data.

However, the worldwide reduction, fragmentation, and degradation of habitats important for bryophytes has led to a loss of species richness and genetic diversity. Threats to bryophytes include deforestation, forest cultivation, land reclamation, urbanization, road and dam construction, mining, wetland drainage, and over-grazing. Invasive, introduced vascular plant species can also devastate native bryophyte floras. Bryophytes are threatened partly because of their Bryologists are becoming increasingly aware of the threatened status of the bryophyte flora, and resolutions expressing concern have been adopted at various conferences (e.g., Geissler and Greene 1982, Tan et al. 1991, Koponen 1992, Bisang and Urmi 1995).

## MATERIALS AND METHODS

Mosses, liverworts, and hornworts belong to a division of the Plant Kingdom known as Bryophyta – the bryophytes. Morphologically, bryophytes are usually small organisms, typically green and lacking some of the complex structures found in vascular plants. They do not produce flowers or seeds, and the majorities have no internal mechanism for transporting water or nutrients. Although they have no roots, they do have root-like structures for anchoring and water absorption. Bryophytes range from a few millimeters to half a metre in height; mosses may be

erect, lateral, or multiple branched in structure. They are found on soil, rocks, and trees throughout the world, from coastal Antarctica to the tundra of the Northern Hemisphere, and from the Australian deserts to the Amazon rainforests. Although small in stature, they are an essential part of the earth's biodiversity and play a significant role in diverse terrestrial and aquatic ecosystems; some species even dominate pond and river habitats. Bryophytes assist in the stabilisation of soil crust by colonising bare ground and rocks, and are essential in nutrient recycling, biomass production, and carbon fixing. In general, they are very efficient at regulating water flow by means of an effective water-retention mechanism. They also have an economic value, whether it is as peat for fuel, horticulture, oil absorption, or as sources for a wide variety of chemical compounds. Bryophytes have long been used for medicinal purposes and their value as pollution indicators is also well known. They are also a food source for animals in cold environments. However, the worldwide reduction, fragmentation, and degradation of habitats important for bryophytes has led to a loss of species richness and genetic diversity.Threats to bryophytes include deforestation, forest cultivation, land reclamation, urbanisation, road and dam construction, mining, wetland drainage, and over-grazing.Invasive, introduced vascular plant species can also devastate native bryophyte floras.

Bryophytes are threatened partly because of their morphology and reproduction rates. They are fragileorganisms, sensitive to drought, and have a relatively low growth rate and therefore desiccate quickly during periods of dry weather. They are highly vulnerable to disturbance and also extremely sensitive to pollution as they lack a cuticule (a layer on the outer cell surface that protects thetissue from, for example, harmful chemicals). Bryophytes are also threatened because of their lack of "image" within the sphere of nature conservation. They are not large, charismatic species, and this, coupled with a lack of understanding of how they contribute towards ecosystem functioning, often results in their being overlooked by the general public and conservation groups.

**USES:**

**New Medical Sources**

One of the reasons for exploring biological compounds in bryophytes is the potential for medical use. It's a scary thought, but substances we know as pesticides and fungicides that discourage insect feeding and bacterial or fungal attack are likely to have antibiotic properties that could prove useful in treating human disease. We know bryophytes contain numerous potentially useful compounds, including oligosaccharides, polysaccharides, sugar alcohols, amino acids, fatty acids, aliphatic compounds, phenylquinones, and aromatic and phenolic substances, but much work remains to link medical effects with specific bryophyte species or compounds (Pant & Tewari 1990). For this reason, traditional uses named here should be viewed with caution because we don't know the dosage needed, side effects, or other precautions that need to be taken. We do know that traditional medicines that may be safe for one race of people may not be for others. After all, those alive today are descendents of survivors.

**Liver Ailments**

Native Americans have used them drugs, fibers, and clothing (University of Michigan, Dearborn 2003). The Doctrine of Signatures (based on the concept that God provided visual cues through the characteristics of the plants), The most widely known use of bryophytes determined by its appearance that of Marchantia polymorpha

**Ringworm**

Riccia spp. were used in the Himalayas to treat ringworm because of the resemblance of the growth habit of those liverworts to the rings made by the worm

In China, 30-40 species of bryophytes may be found on the shelves of the local pharmacist (Ding 1982). Among . the more common ones are Rhodobryum giganteum and R. roseum to treat nervous prostration and cardio vascular diseases, the latter being a use that may have scientific merit (Wu 1982).

**Inflammation and Fever**

Polytrichum commune has been used in China to reduce inflammation and fever (Ding 1982), and the Seminole native people in North America used the small mosses Barbula unguiculata and

**Bryum capillare**, as well as larger mosses like Octoblepharum albidum, as external applications for fever and body aches (Sturtevant1954).

**Diuretics and Laxatives**

The Chinese also use **Polytrichum commune** as a detergent diuretic, laxative, and hemostatic agent (Hu 1987).

**Gynecology**

The absorbent properties that make Sphagnum an excellent bandage also make it suitable for diapers and sanitary napkins, a practice currently in use by Johnson and Johnson Company (D. H. Vitt, pers. comm.). Sphagnum has also been used as a contraceptive

**Disinfectant and Infections**

The Native American Nitinahts also used Sphagnum as a disinfectant (Turner et al. 1983). Fissidens is used in China as an antibacterial agent for swollen throats and other symptoms of bacterial infection, and in Bolivia it likewise has medicinal uses. Judith Sullivan (Bryonet, 16 January 2007) reported seeing labels on Chinese medicines that included Grimmia, Atrichum, Polytrichum, and Thuidium, primarily as anti-bacterial and anti-inflammatory agents. Polytrichum juniperinum is used there for some prostate and urinary difficulties. In China, Polytrichum commune is boiled make a tea for treating the common cold and reputedly helps to dissolve stones of the kidney and gall bladder (Gulabani 1974). Dried Sphagnum is sold to treat emorrhages (Bland 1971), and S. teres is used to treat eye diseases (Ding 1982). Haplocladium microphyllum is sold to treat cystitis, bronchitis, tonsillitis, and tympanitis (Ding 1982).

**Lung Diseases**

The similarity of Marchantia polymorpha (Figure 2) thalli to the texture of lung tissue caused Europeans to use that liverwort to treat pulmonary tuberculosis (Bland 1971). The other side of the coin is the ability of some mosses, especially Sphagnum, to harbor fungi that cause lung disease. Sphagnum was once thought to harbor Mycobacteria, the genus in which the tuberculosis bacterium resides, but now it seems that it is not the reservoir for this genus it was thought to be (Deriu et al. 1995).

**Skin Treatments**

Himalayan Indians use a mixture of moss ashes with fat and honey to soothe and heal cuts, burns, and wounds (Pant et al. 1986), claiming that these ashes heal wounds more quickly (Pant & Tewari 1989). Among the Native Americans, the Cheyenne in Montana use Polytrichum juniperinum (Figure 8) in medicines (Hart 1981). In Utah, USA, the Gosuite native peoples used Bryum, Mnium, Philonotis (Figure 10), and various matted hypnaceous forms crushed into a paste applied to reduce the pain of burns, bruises, and wounds (Flowers 1957). A mixture of the thallose liverworts Conocephalum conicum (Figure 11) and Marchantia polymorpha (Figure 2) with vegetable oils is used in China on bites, boils, burns, cuts, eczema, and wounds (Wu 1977; Ding 1982; Ando 1983). Sphagnum was used by Native Americans as a carrier for berries that were rubbed on children's sores the thallus (Pant & Tewari 1989).(Carrier Linguistic Committee 1973). Himalayan Indians have used Marchantia polymorpha or M. palmata to treat boils and abscesses because the young archegoniophore resembles a boil as it emerges from

**Surgical and Wounds**

Bryophytes have been used both in treating and incushioning wounds. In Utah, the Gosuite native people used poultices of Bryum, Mnium, Philonotis (Figure 10), and various matted hypnaceous forms as padding under splints to set broken bones. But it is Sphagnum that has gained fame for its use as a

**Antifungal Activity**

Although mosses are known to harbor fungi and will quickly become infected if kept moist in a plastic bag, some fungi are inhibited by many species of bryophytes, including many that cause skin infections. Jennings (1926) reported moss immunity to molds as early as 1926, but the possibility of using them as a source of antifungal activity seems to have been largely overlooked. Among these, Hypnum cupressiforme (Figure 20) has remarkable antibacterial and antifungal effects. The absence of fungal diseases in liverworts led Pryce (1972) to suggest that lunularic acid, an aging hormone found in liverworts

**Antiviral Activity**

The Maoris of New Zealand have used bryophytes to treat venereal disease by packing wet plants on the infected organs (Frahm 2004). Even viruses may some day be cured by extracts of mosses, but we cannot simply identify them as "moss" as our ecologist friends have been wanton to do in reporting the ground cover. For example, van Hoof and coworkers (1981) found no effect of 20 species of moss extracts on the herpes virus, but earlier Klöcking et al. (1976) found that at least some peat humic acids possess antiviral activity against herpes simplex virus types 1 and 2, interfering primarily with the adsorption of viruses to host cells. Sphagnum produces several antivirally active humic acids, and Camptothecium extracts can inhibit growth of the poliovirus (Witthauer et al. 1976). Nevertheless, actual usage of bryophytic extracts has nbut not in mosses, might be responsible for liverwort antifungal activity. Banerjee and Sen (1979) found that the degree of antibiotic activity in a given species may depend on the age of the gametophyte; Matsuo et al. (1982a, 1982b, 1983) supported this conclusion by demonstrating that antifungal activity against Botrytis cinerea, Pythium debaryanum, and Rhizoctonia solani by

**Anti-tumor Properties**

In the same year as the Madsen and Pates (1952) report of antibiotics in bryophytes, Belkin et al. (1952-53) reported anticancer activity against Sarcoma 37 in mice, using extracts of Polytrichum juniperinum. But application of the antitumor activity fared no better and was apparently not rediscovered in bryophytes for two decades. In 1976, Adamek reported that peat preparations hold some promise against some types of human cancer. In 1977, Ohta and coworkers (1977) reported that diplophyllin, isolated from the liverworts Diplophyllum albicans (Figure 22) and D. taxifolium, shows significant activity (ED50 4-16 µg/ml) against human epidermoid carcinoma (KB cell culture).

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# ETHNOBOTANICAL REMEDIES OF TRIBAL PEOPLE IN THE MAHA-MUTHARAM MANDAL OF KARIMNAGAR DISTRICT OF ANDHRA PRADESH, INDIA

**E. NARASIMHA MURTHY, N. VENUMADHAV & M. ARJUN[1]**

Department of Botany, Satavahana University, Karimnagar-505 001

[1]Department of Botany, Telangana University, Dichpally0593322

E-mail: murthyen@yahoo.co.in; nalimela0@gmail.com

## ABSTRACT

Several field trips were conducted during 2011-2013 to document the botanical knowledge of the ethnic tribes inhabiting in the Maha-Muttaram mandal. Here we reported more than 20 ethno-medicinal plants from the tribal people inhabiting the mandal. They are remedies for various ailments. These ethno-medicinal plant specimens are preserved in the Satavahana University Herbarium, Karimnagar.

## INTRODUCTION:

. In a developing country like India, where major portion of its population is residing in rural and tribal areas and which have their own culture specific medical heritage, the health policy makers and health care planners are not left the tribal areas and the rural areas for many health care programs even met with stiff resistance. While local people usually welcome the provision of hospitals and public health programs, the shift to using biomedicine often means that healing traditions are eroded and traditional knowledge lost in the process. This paves great flaw to their native medicine system. Before the existence of ethno-medicine from the tribal community, it is necessary to document and understand this culture-specific medical heritage. (K.S. Brumot & T.S. Naidu, 2007).Among the scheduled tribes of Andhra Pradesh, Erukalas, Gonds,Koyas and Lambada are the major communities in the Karimnagar district. Of several

natural forest ecosystems in the district Ramagiri and Mahadevpur are known for their medicinal flora. Kapoor & Kapoor (1980) were the first to pay attention publish the medicinal plant wealth of Karimnagar district. Later, Hemadri (1990) reported 436medicinal plants of the district( just mere names and vernaculars) . Ravishankar (1990) studied the ethnobotany of Karimnagar district, along with the adjacent Adilabad district. An estimation of local dependency on forest was made by Reddy V.M. (1996) and Rao et al (1998). Rao etal (1998) reported 30-33 plants used in ethno-medicine by the tribals of Mahadevapur. There are ethnobotanical studies with emphasis on ethnoveterinary medicine in the neighbouring district of Warangal (Reddy et al 1992) and Nalgonda (Reddy & Raju 2000). C.S. Reddy et al (2001) made an attempt to study the ethnoveterinary medicinal plants used by the Gonds of Karimangar district. Naqvi (2001) recorded not more than 150 ethno medicinal plants from the Karimnagar district in his Ph.D. thesis.

**STUDY AREA:**

The district lies on the northern part of Andhra Pradesh approximately between the latitudes 18 deg and 19 deg and longitudes 78 deg. 30 mn and 80 deg 31 min. The district is bounded on the north by Adilabad district, on the west by Medak District,on the North West by Nizamabad on the South by Warangal District and on the East by Godavari River. The forest in the district are grouped into two divisions viz. Karimnagar East Division and Karimnagar West Division. The east division consists of four ranges viz. Azamnagar, Bhupalapalle, Chintakani and Mahadevpur while the west forest contains five ranges viz Jagitial, Raikal, Koidmial,Manthani and Sircilla. The forest of this district fall under Tropical dry deciduous and Tropical thorn forest types consisting of mixed teak and miscellaneous type of corporation. The dominant Scheduled Tribes Communities are Koya (Dorasattam) and Gond. The Scheduled Tribe Population is concentrated in the Revenue mandals of Maha-mutharam, Mahadevpur, Malharrao, Ellareddypet,Husnabad, Kataram and Sarangapur At Mahadevpur forest range Nayakpod (Padmanayaka), Koya (Dorasattamu) are found among Local tribes with different habits, cultures and socio economic backgrounds. Of these Koyas are mainly settled cultivators, but depend largely upon the near by forests for non-timber products. Nayakapods are primarily agriculturists and shifting cultivaters. They also collect forest produce. Lambadas a gypsy non-local tribe are largely workers, at places, settled agriculturists.

## MATERIALS AND METHODS

Ethnobotanical survey included repeated interviews with aged ethnic people, local herbal healers, shepherds, tribal headmen, owners of cattle herds, etc., in different seasons for two consecutive years. Several field trips were conducted between the years 2004 to 2006 in the sanctuary area to record the utilization of the plant wealth used by the local tribal communities. The data were collected through questionnaires, discussions among the tribal people in their local language. The information on useful plant species, parts used, local names and mode of utilization was collected. The data collected were further verified and cross-checked in different villages with different tribal sub communities. Plants used in their daily needs were also collected. The plant specimens were pressed and deposited in the Herbarium of Botany Department (KUH), Kakatiya University, Warangal, Andhra Pradesh, India. The sorted information on ethnobotanical knowledge of tribal inhabitants is enumerated under alphabetically by botanical names of plants, name of the family is given in parenthesis and their local names, habit, distribution, and phenology are given.

## ENUMERATION

*Ceriscoides turgida* (Roxb.)Tirvengadam (Rubiaceae)
Vern.: Tella velaga kaya
An armed deciduous tree.
Occasional in dry deciduous forests
Fl.: & Fr.: Mar.-Jul.
Fruits edible, fruits are cooked and taken in Anaemia and constipation

*Phyllanthus reticulatus* Poiret in Lam. (Phyllanthaceae)
Vern.: Pulicheru
Large shrub.
Common in hedges and at the foot hills of forests.
Fl.&Fr.: July-March
Roots of *Phyllanthus reticulatus* and bark of *Aegle marmelos* (Maredu), grinded with fruits of *Feronia elephantum* (Velaga kaya) in water and given in Diarrhoea.

*Plumbago zeylanica* L. (Plumbaginaceae)

Vern.: Chitramoolamu

Annual erect herb.

Occasional in waste lands, hedges and forests.

Fl.&Fr.: Sept.-Dec.

Roots are grinded with water and paste is applied on wounds and warts

*Buchanania axillaris* (Desr.)Ramam (Anacardiaceae)

Vern.: Pedda morli

Medium sized tree.

Occasional in hilly forest areas in all districts.

Fl.&Fr.: June-Dec.

Gum swallowed in the form of tablets in chest pain and body pains

*Shcleichera oleosa* (Lour.)Okem. (Sapindaceae)

Vern.: Pusuku

Large deciduous tree.

Common in dry deciduous forests.

Fl.& Fr.: Jan.-Apr.

Stem bark is grinded with milk, and paste is applied on wounds

*Litsea glutinosa* (Lour.)C.B. Robinson (Lauraceae)

Vern.: Nara mamidi

Moderate sized evergreen, very variable tree.

Common in hill forests.

Fl.&Fr.: June-April.

Crushed stem bark is bandaged on broken limbs

*Cassia occidantalis* L. (Caesalpiniaceae)

Vern.: Namili vittulu

Erect, glabrous undershrubs.

Common in all plains.

Fl.& Fr.: throughout the year

Seeds are grinded and paste is applied in conjunctivitis

*Urginea indica* (Roxb.) Kunth. (Lilliaceae)

Vern.: Nall ulligadda

Bulbous herb.

Occasional in plains and on hills.

Bulbs are crushed and taken in fevers

*Lannea coromandelica* (Houtt.)Merr. (Anacardiaceae)

Vern.: Dumpidi

Large deciduous tree.

Common in deciduous forests.

Fl.&Fr.: Mar.-May.

Stem bark is grinded, paste is applied on wounds and used as galactagogue

*Cissus quadrangularis* L. (Vitaceae)

Vern.: Nalleru

Rambling shrubs.

Common in scrub jungles, wastelands.

Fl.& Fr.: June-Dec.

Whole plant is crushed and used as bandaged on wounds

*Azima tetracantha* Lam. (Salvadoraceae)

Vern.: Uppu-chekka

Straggling, armed, bushy shrub.

In hedges, thorny scrub jungles.

Fl.&Fr.:

Root bark is grinded, with the stem bark of *Dichrostachys cineraria* used, and fermented and take one glass of juice in early morning with empty stomach in Rheumatism.

*Madhuca indica* J. Gmelin (Sapotaceae)
Vern.: Ippa chettu
Large deciduous tree.
Abundant in forests, occasional on hills and in villages.
Fl.&Fr.: March-Sept.
Stem bark crushed with Cow urine and taken in Arthritis.

*Celastrus panicualtus* Willd. (Celastraceae)
Vern.: Maneti teega
Climbing shrub.
Common in dry forests.
Fl.&Fr.: Apr.-Dec.
Seed oil is applied in Knee-pains and Paralysis

*Pongamia pinnata* (L.)Pierre (Fabaceae)
Vern.: Kanuga
Medium sized, evergreen tree.
Common along river banks, often planted.
Fl.&Fr.: Feb.-Oct.
Seed paste is applied in Scabies

*Abrus precatorius* L. (Fabaceae)
Vern.: Guruvinda
Stragglers.
In hedges and among bushes in open lands.
Fl.&Fr.: July-Dec.
Seed paste is applied on swellings to heal.
*Phyllanthus emblica* L. (Euphorbiaceae)
Vern.: Usiri

Medium sized tree.

Common in dry deciduous forests/cultivated.

Fl.&Fr.: Oct.-Dec.

Fruit juice is mixed with Garlic juice is dropped in dental problems.

*Calycopteris floribunda* (Roxb.)Poiret in Lam. (Combretaceae)

Vern.: Teega dhari, Bonth teega

Scandent climbing shrub.

Common in dry deciduous forests.

Fl.&Fr.: Feb.-May.

Root bark is grinded with roots of Ellipta prostrate L. , used in Snake bite

*Cassia fistula* L. (Caesalpiniaceae)

Vern.: Rela

Small deciduous tree.

Common in deciduous forests.

Fl.&Fr.: Mar.-Dec.

Stem bark paste is applied on Scorpion bite

*Cassia tora* L. (Caesalpiniaceae)

Vern.: Tagirisa

Annual herbs.

Common in all plains, fallow lands, and in forest undergrowth.

Fl.& Fr.: Sept.-Dec.

Leaves are cooked and eaten in Anaemia

*Soymida febrifuga* (Roxb.)A.Juss. (Meliaceae)

Vern.: Somida

Lofty glabrous tree.

Common in the dry forests of most districts.

Fl.&Fr.: Apr.-Oct.

Bark crushed with water to control dysentery and Cough

**RESULTS AND DISCUSSION**

There are 20 medicinal plants, including the six ethnoveterinary species, used by the tribal people in the revenue *mandal*. They are mainly used in the chest pain, Anaemia, Snakebite, Scorpion bite, Conjunctivitis, diarrhoea, indigestion, and rheumatism etc. Of the species, 10 are trees, 4 shrubs, 4 climbers, and 2 herbs. Of the list, usually there one species each of a family but for Caesalpiniaceae, which has three while Euphorbiaceae, Papilionaceae, Anacardiaceae represent with two species each. Of the plant parts used, stem bark is used in most of the preparations, followed by root, leaf , fruits, seeds and bulbs. Root paste of *Plumbago zeylanica* is used to relieve pains. Leaf juice of *Bauhinia racemosa* is dropped in Conjunctivitis. Gum of *Buchanania lanzan* is used for chest pain. Seed oil of *Celastrus paniculatus* is applied in Rheumatism. Root paste of *Calycopteris floribunda* is useful in snake bite. Crushed bark of *Cassia fistula* is applied on scorpion bite. Most of the medicinal plants are used singly. This data provide basic source for further studies aimed at conservation, cultivation, improvement of traditional medicine and economic welfare of rural and tribal population of the region

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# Ethnomedicinal plants used to cure Digestive disorders

***Dr. Ratna Manjula, R.***

Lecturer in Botany, Government Degree College, Rammannapet, Nalgonda District, Andhra Pradesh, 530 003, India (Email Id: rreatnamanjula1973@gmail.com)

**ABSTRACT**

Medicinal plants have proved to be effective for prevention and cure of various disorders. Their use against digestive disorders is very common at household level. The future generations can benefit, in case this knowledge is documented after its validation. Participatory Rural Appraisal (PRA) methods and tools were used for interacting with the tribal women who were used as the main source of information. Scientific validation helped to determine the pharmacognosy and pharmacology status of the plants. The sources used for scientific validation were mainly the view of the experts and scientific literature besides adding the social value considering the views of *Vaidyas.* The identification validation and documentation of the plant material from the Khammam forest of Andhra Pradesh reveal that 24 species belonging to 23 genera and 22 families were used for digestive disorders. Most of them were herbs closely followed by trees. The common Digestive disorders are indigestion, stomach ache, Ulcers, Gastric trouble and Diarrhea/Dysentery. They were used for their preventive and curative properties. Most of these plants were available in the vicinity or their parts were available in form of spices at the household level. These indigenous methods of treatment based on medicinal plants are still an important part of social life and culture in Khammam. The claimed therapeutic values of the reported species are to be critically examined to establish their safety and effectiveness and to preserve these flora, which may otherwise be extinct due to deforestation.

**Keywords: Ethnomedicine, Digestive disorders, Khammam district, Andhra Pradesh**

## INTRODUCTION

Khammam district came into existence on October 1, 1953. It was carved out from the taluks of Warangal and East Godavari districts and occupies an area of 16,029 km2 covering 46 Mandal Praja Parishads. It lies between 16° 45' and 18° 35' North latitude and between 79° 47' and 80°

47' East longitude. The total population of the district is 25, 78, 927 of which 6, 82,617 (26.46%) are scheduled tribes as per 2001 census. The district presents a rough topography with dissected uplands and hills, which sometimes exceeds 600 m. Temperature varies from 10 to 44° C. The average rainfall of the district is 1045 mm. The main tribes of the district are Koyas, Gonds/Naikpods, Lambadas and KondaReddis. The district has more than 52.6% forest land with 4 divisions. Dry deciduous, moist deciduous, riparian, scrub and grass land forest types are predominant. Though digestive disorders are important diseases exclusive studies on it are not many necessitating the present investigation in Khammam district of Andhra Pradesh state.

## METHODOLOGY

An ethnobotanical survey was conducted among the tribal communities of the district. Elder people, medicine men, tribal physicians and village old mothers were consulted to record first-hand information on ethnomedicinal uses, methods of preparation and administration of crude drugs. The information from the tribal people was compared with literature. The voucher specimens were deposited in the Herbarium of the Department of Botany, Andhra University,Visakhapatnam.

## Enumeration

***Abelmoschus moschatus* Medic. MALVACEAE**

VN: Yerra benda S: Latakasturika H: Maskdana E: Musk mallow

Equal quantities of fruit peel along with fruit pulp of albakara and tender leaves of *Syzygium cumini* are ground. Ten g of that paste is administered with water once a day for 3 d.

***Aegle marmelos* (L.) Correa. RUTACEAE**

VN: Maredu S: Bilva H: Bilva E: Bael tree

Three spoonful of root decoction is administered daily once till cure.

***Allium sativum* L. LILIACEAE**

VN: Tellagadda S: Lasuna H: Lasun E: Garlic

Bulbs with leaves of *Andrographis paniculata* and *Coleus amboinicus* are taken in equal quantities and ground. 2 spoonfuls of paste is administered daily once for 8 d.

***Averrhoa carambola* L. AVERRHOACEAE**

VN: Zeera, Carambola apple E: Carambola apple

One spoonful of fruit powder is taken with honey or sugar syrup once a day till cure.

***Basella rubra* L. BASELLACEAE**

VN: Yerra bachli S: Upodika H: Poi E: Indian spinach

Two spoonful of root decoction is administered daily once for till cure.

***Boswellia serrata* Roxb. ex Colebr. BURSERACEAE**

VN: Anduga S: Sallaki H: Kundur E: Indian olibanum

Twenty ml of seed decoction is administered once a day for 5 d.

***Carica papaya* L. CARICACEAE**

VN: Boppayi S: Eranda H: Papaya E: Papaya tree

Latex is dried in sun light and made into powder. Half spoonful of powder is administered with water.

***Costus speciosus* (Koen.) Sm. ZINGIBERACEAE**

VN: Chengalva kostu S: Canda H: Kebu E: Spiral ginger

Thirty ml of tuber juice is taken twice a day for 5 d.

***Curcuma aromatica* Sal. ZINGIBERACEAE**

VN: Kasthuri dumpa, S: Aranya harida H: Jangli-Haldi E: Wild turmeric

Fifteen ml of whole plant decoction is taken twice a day for 15 d.

***Cuscuta reflexa* Roxb. CUSCUTACEAE**

VN: Pachiteega E: Horse tail parasite

Three spoonful of whole plant decoction mixed with one spoonful of crystal sugar is administered once a day for 5 d early in the morning.

***Entada rheedii* Spreng. MIMOSACEAE**

VN: Bojje, Gilla teega S: Gilla E: Giants rattle

Fifteen ml of root decoction is administered daily once for 3 d.

***Mentha spicata* L. LAMIACEAE**

VN: Pudhina E: Spearmint

Leaf decoction is administered in 50 ml dose once daily.

***Musa paradisiaca* L. MUSACEAE**

VN: Arati S: Vakalakshmi H: Kela E: Plantain

Flower juice is taken daily in doses of one spoonful once a day till cure.

***Opuntia dillenii* (Ker-Gawl.) Haw. CACTACEAE**

VN: Naga jamudu S: Vidara-visvasaraka H: Nag phana E: Prickly pear

Twenty ml of root juice is taken along with half spoon of black pepper powder twice a day for 3 d.

***Oxalis corniculata* L. OXALIDACEAE**

VN: Pulichintha S: Cangeri H: Tinpatiya E: Indian sorrel

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Ten ml of leaf paste is administered with a cup of butter milk thrice a day for 3 d.

***Phyllanthus acidus* (L.) Skeels EUPHORBIACEAE**

VN: Rasa usiri E: Country gooseberry

Thirty g of fruit pulp mixed with one spoon of honey is administered twice a day till cure.

***Plumbago rosea* L.PLUMBAGINACEAE**

VN: Yerrachitramulamu S: Dahanah H: Lalcitra E: Rosy flowered lead-wort

One spoonful of whole plant paste is taken with a cup of curd twice a day for 5-7 d.

***Plumbago zeylanica* L. PLUMBAGINACEAE**

VN: Tella chitramulam S: Chitraka H: Chitta E: Ceylon leads wort

a) One spoonful of stem bark powder is taken with water once a day till cure.

b) Roots are ground along with cumin seeds, asafoetida, dried ginger and soamp and made into tablets of soapnut seed size and one tablet is administered before lunch once a day till cure.

***Punica granatum* L. PUNICACEAE**

VN: Dhanimma S: Dadimasara H: Anar E: Pomegranate

Fruit coat pestled with stem bark of *Alstonia scholaris* is administered in doses of 5 g tablets once a day for one month.

***Sesbania sesban* (L.) Merr. FABACEAE**

VN: Kisureu chettu S: Jayanti H: Jhijan E: Common sesban

A spoonful of seed paste mixed with a spoon of honey is administered thrice a day for 3 d.

***Schleichera oleosa* (Lour.) Oken. SAPINDACEAE**

VN: Buchi manu S: Kosamra H: Kussum E: Lac tree

Two spoonful of stem bark decoction mixed with one spoon of fruit powders of *Terminalia chebula*, *T. bellerica* and *Phyllanthus emblica* is administered twice a day for 5-10 d.

***Triumfetta rhomboidea* Jacq. TILIACEAE**

VN: Chiru sitrika S: Jhinjharita H: Mendurli E: Bur weed

Ten ml of root decoction is administered twice a day for 3-5 d.

***Vanda spathulata* (L.) Spr. ORCHIDACEAE**

VN: Nusti badanika E: Wild celery

Twenty ml of leaf juice is taken twice a day for 10 d.

***Ziziphus mauritiana* Lam. RHAMNACEAE**

VN: Regu S: Kola H: Kuvala E: Indian jujube

Fruit pulp is taken in 3 spoonful dose along with 3 spoonful of sugar twice a day for 7 d.

**RESULTS AND DISCUSSION**

The present study yielded 24 species belonging to 23 genera and 22 families used for curing digestive disorders by the aborigines of the state. Nearly half of them are herbs (9) and the rest are trees (8), shrubs (4) ,climbers (2), and phylloclade(1). Only two families namely Plumbaginaceae and Zingiberaceae are represented by two species each and Averrhoaceae, Basellacea, Burseraceae, Caricaceae, Cuscutaceae, Euphorbiaceae, Lamiaceae, Lillaceae, Malvaceae, Mimosaceae, Musaceae, Orchidaceae, Oxalidaceae, Plumbaginaceae, Puniaceae, Rhamnaceae, Rutaceae, Sapindaceae, and Taliaceae are the families representing one family each. Except two all the practices (24) involved one plant only. The combination practices involved 2 plants and 3 plants. The common Digestive disorders are indigestion, stomach ache, Ulcers, Gastric trouble and Diarrhea/Desentry. The common dosage forms include paste, decoction, juice. The forests are rich in medicinal plants, many are still not known to us. Present investigation indicates that the forests are blessed with magnificent diversity of ethno-medicinal plants used to cure many diseases. The present study will give new incentive to the traditional system of healthcare. Further, this approach for the treatment of skin diseases is a practical, cost-effective and biological safe.

**SUGGESTIONS**

Tribal people use number of locally available plant parts for prevention and cure of digestive disorders. These plants are used as they have been found to possesses properties which are effective against digestive disorders. The use of different parts of the medicinal plants not only help to decrease the cost of medication but are also locally available, with least side effect as compared to chemical based medication. Paul and Ramanathan (2002) reported that nearly seventy five per cent of the 121 plants derived prescription drugs used world wide, were discovered following leads from indigenous medicine. The use of these medicinal plants should be encouraged through the dissemination of the knowledge among the masses. This will help to ensure the preservation and continuous passage of this effective knowledge on the use of various plants for prevention and cure of health related disorders.

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# Phytochemical and antimicrobial screening of certain medicinal plants from Kothagudem, A.P.

V.V.Ramana, Lecturer in Botany,

Singareni Colleries Womens Degree College, Kothagudem,A.P.

**Abstract**

Kothagudem in Khammam district of Andhra Pradesh is a Coal town with tribal hamlets around it. Ethnobotanical studies were conducted in this area and a few plants like Bauhinia vauhlii, Chloroxylon Sweitinia, Alangium lamarckii and Celastrus senegalensis which are widely used by the tribes were selected for the study. Physicochemical studies like total ash, acid soluble ash and Phytochemical tests for compounds like sterols, terpenoids, sugars, alkaloids and saponins were conducted.

The antimicrobial activity of leaf and bark extracts were tested on different microbial cultures like E.coli, Salmonella species, Pseudomonas, Klebsiella and Aspergillus in different concentrations using filter paper disc diffusion method and the degree of inhibition is studied. Inview of the popularity of herbal medicine, this was taken up and the susceptibility of the organism was tested.

**Introduction :**

Kothagudem, in Khammam district of Andhra Pradesh is a Singareni coal town with many tribal hamlets around it. The town is surrounded by thick forests with diversified vegetation.

Plants have been used as source of medicine throughout the world for more than 5000 years and still continue to occupy a prime place in traditional as well as in modern medicine.

These days the interest in the field of herbal medicines and plant natural products has been increased. Therefore, it has become necessary to have systemic knowledge, about the herbal drugs, their application and practical utilization.

Medicinal plants play an important role in human health care. Most of the supply of the drugs is obtained from wild plants (Mundappa & Amen 1998). Ethno medicines are receiving great attention all over the world; hence there is an urgent need to lay emphasis on receiving the heritable knowledge on the medicinal plants. But some plants have already become extinct, some plants like Chloroxylon are vulnerable and many are facing a danger of extinction. Hence a survey was carried out for native medicinal plants in the vicinity of Kothagudem and selected four plants which are widely used by the local tribes for the study. The selected Plants are Bauhinia vauhlii, Chloroxylon sweitinia, Alangium lamarckii and Celastrus senegalensis. Phytochemical tests were conducted and anti microbial studies were carried out on the selected plants.

**Description of the plants:**

**Bauhinia vahlii, W& A. Family ceasalpinaceae, Vern. Adda tiga (Telugu) :**

The plant is tolerably common in the damper parts of Telangana forests. It is the largest of the climbing plants of the forest; and attains a size of 3-4 feet in girth and 100 feet long. It is a gigantic, climbing evergreen tree. Branchlets are densely pubescent and terminating in a pair of revolute tendrils. Leaves are variable in size, often up to 18" diameter, as broad as long or broader, deeply cordate. The large leaves are used for making plates for eating from and rough umbrellas, etc.,


Photograph no.1. Bauhinia vahlii from Seleru area.

**Chloroxylon swietenia, DC.; Family Meliaceae, Vern.billudu (Tel) :**

Chloroxylon is the satin wood of commerce. It is endemic to India and Srilanka. Commonly found in most forests in the Telingana region. It is a moderate–sized deciduous tree, with a thick, soft, spongy, bark light grey or yellow. Young parts, petioles and inflorescence clothed with short grey pubescence. The crushed leaves have a fragrant resinous smell and are applied to wounds. The bark is used as astringent. In addition to its medicinal value, it has insect repellent property. The tribes hang the twigs in their houses to repel mosquitoes and insects.

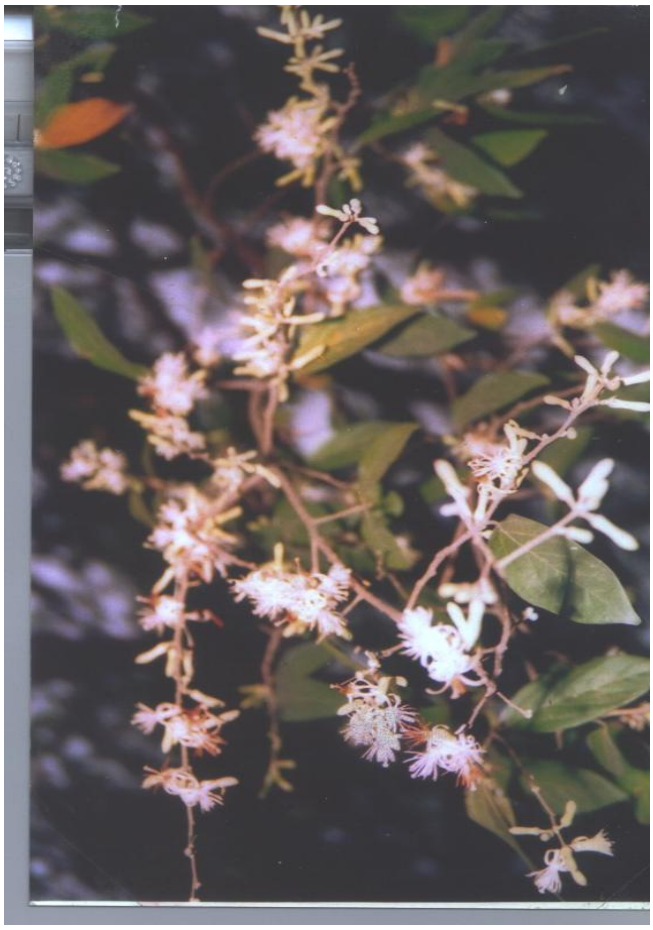
It is listed as vulnerable species (World Conservation Monitoring Center, 1992)

Photograph no. 2. Chloroxylon swietenia from Kinnerasani bioregion.

**Alangium lamarckii, Thwaite.; Family Cornaceae, (Alangiaceae) Vern.udugu (Tel) :**

Varying in size from a large shrub to a considerable tree, branches often spine scent. Bark grey, when young orange-yellow, fibrous. Leaves are alternate and membranous. Flowers are bisexual whitish, fragrant, solitary or aggregate in the axils of the leaves.

The plant is very common, found throughout the Hyderabad forests. It is usually a small tree, but often attains a height of 20-30 feet, with a circumference of about 30 inches. It yields a first class fuel and grows excellently from coppice. The root has a reputation in snake bites and the leaves are also medicinal.



Photograph no 3. Alangium lamackii from Paloncha area.

**Celastrus senegalensis, Lam,;Family Celastraceae, Vern.Danti(Tel) :**

The plant is very common shrub in all forests throughout the drier parts. The plant is tall, at base it is like a shrub as it grows in size it becomes a woody climber. The wood is hard and durable, but does not grow to any size. The seeds and leaves are used in native medicine.

Photograph no. 4. Celastrus cenegalensis from Chathakonda area.

**Materials & Methods:**

A few twigs of the selected plants were collected from the near by forest area. The identity of the collected material was checked with help of flora. The external features were noted.

The material was shade dried and the leaf & bark were powdered. The powder was sieved through 70 mm mesh stored in polythene bottles for analysis. Micro chemical tests for powder of leaf and bark were conducted (Kokate and Khandelwal, 1994).

**Anti microbial study:**

Crude leaf extracts of all the four plants were tested for anti microbial activity by following standard Agar disc diffusion method (NCLLS, 1977). Test organisms were E.coli, Pseudomonas, Staphylococcus aureus, Aspergillus and Curvularea.

**Results & discussion:**

**Table no. 1:** Anti microbial activity of the plants tested.

| S.No | Name of the plant | Susceptibility Of the Organism | | | | |
|---|---|---|---|---|---|---|
| | | E.coli | Pseudomonas | S.aureus | Aspergillus | Curvularea |
| 1 | Alangium lamarckii | + | + | + | _ | _ |
| 2 | Bauhinia vahlii | _ | _ | + | _ | + |
| 3 | Celastrus senegalensis | + | + | _ | _ | + |
| 4 | Chloroxylon swietenia | + | + | + | + | + |

+ indicates zone of inhibition; _ indicates no zone of inhibition

The results on anti microbial studies (Table no 1) indicate that Alangium showed antibacterial activity for all the bacteria tested while it has no anti fungal activity against the fungi studied. Chloroxylon showed both antifungal and antibacterial activity. B.vahlii was positive against S.aureus and Curvularea but was negative against the other organisms. Celastrus showed positive action against E.coli, Pseudomonas and Curvularea, but was negative against S.aures and Aspergillus.

**Table no. 2:** Preliminary Phytochemical Screening of leaf extracts.

| S.No | Phyto- Chemical constituent | Alangium lamarckii | Bauhinia vahlii | Celastrus senegalensis | Chloroxylon swietenia |
|---|---|---|---|---|---|
| 1 | Steroids | + | + | + | + |
| 2 | Triterpenoids | + | + | _ | + |
| 3 | Reducing sugars | + | + | + | + |
| 4 | Alkaloids | + | + | + | + |
| 5 | Phenolic Compounds | + | + | + | + |
| 6 | Saponins | + | + | + | + |
| 7 | Tannins | + | + | + | _ |
| 8 | Carbohydrates | + | + | + | + |
| 9 | Flavanoids | _ | + | _ | + |
| 10 | Proteins | + | + | + | + |

+ indicates present; _ indicates absent

Preliminary phytochemical tests of the leaf extracts (Table no 2) indicated the presence of carbohydrates, reducing sugars, proteins, steroids, triterpenoids , alkaloids, flavanoids, phenolic compounds, tannins and saponins in B.vahlii, all except flavanoids in A.lamackii,all except triterpenoids in C. senegalensis and in C.swietenia tannins were absent.

Enormous varieties of organic compounds (primary metabolites and secondary metabolites) are derived from plants. Secondary metabolites like alkaloids, essential oils, tannins, steroids, triterpenoids, anti biotics etc., play an important role in, cosmetic, perfumes, dying, flavoring and pharmaceutical industries. They exhibit antimicrobial activity (Oliver, 1960), (Sainsbury and Sofowa, 1971). The cumin oil shows antifungal activity (Ibrahim et al, 2001) and eugenol was responsible for antibacterial activity.

Garg and Dengre (1983& 1988) reported invitro antifungal efficacy of essential oil from stem and flowers of Chloroxylon swietenia against seven fungi like Rhizopus, Fusarium, Aspergillus, Curvularea, Trichophyton, Trichoderma and Candida.

Bio-compounds are ecofriendly. They are better curative agents than chemical agents to combat pest problems and can act as insect repellents. They also have the anti bacterial and anti fungal properties. Crude extracts of all the four plant species studied showed anti microbial activity. The actual constituent responsible for the inhibitory activity is to be established. Its potentiality as bio-pesticide is to be determined.

However, further isolation, purification and characterization of compounds is essential to confirm medicinal property and efforts are needed to increase the content of the bio-active compounds to raise them to the status of industrial raw material.

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# DIRECT PLANTLET REGENERATION FROM COTYLEDON AND LEAF EXPLANTS OF *MELOTHRIA MADERASPATANA* (L)

**Srilatha.T[1] Sammaiah.D[3] NarasingaRao.N[5]Kanaka Rajesham. Ch[4] and Ugandhar.T[2]**

[1]Department of Botany Govt Degree & P.G.College for Women Warangal 506001

[2]Department of Botany, S.R.R.Govt Arts & Science College Karimnagar-505001

[3]Department of Botany, Govt Degree Huzurabad-505001

[4]Department of Botany Govt Degree & P.G.College for Women Karimnagar 505001

[5]Department of Botany University College Kakatiya University Warangal -506009

***E-mail:tugandharbiotech@gmail.com**

Abstract:- The objective of this work was to study the *in vitro* organogenesis of *Melothria maderaspatana* L. by the induction of adventitious buds in cotyledon segments explants cultured in MS medium supplemented with cytokinin. Explants were collected from ten-day-old *in vitro* germinated seedlings, considering the distal and proximal cotyledon regions. The data obtained showed that *in vitro* organogenesis of *Melothria maderaspatana* L. occurred with higher efficiency, when cotyledon segments from the proximal region collected from ten-day-old seedlings were cultivated in medium MS, supplemented with TDZ (1.0-5.0 mg/L) Kn (1.0-5.0 mg/L),IAA (0.5 mg/L)+ TDZ (1.0-5.0 mg/L) and IAA (0.5 mg/L)+Kn (1.0-5.0 mg/L) for shoot proliferation IAA (0.5 mg/L)+TDZ (3.0 mg/L) was proved to be best for induction of shoots for cotyledon and Leaf explants. All regenerated plantlets were rooted on MS medium supplemented with (1.0 mg/L) IBA the regenerated plants grew normally in the green house.

***Key words:*** *Melothria maderaspatana* traditional medicinal climber, Cotyledon, Leaf and *in vitro* culture.

**Introduction:-**

*Melothria maderaspatana* (L.) M.Roem. of the family, Cucurbitaceae is an important traditional medicinal plant generally practiced in Eastern division of Mahadevapur Reserve Forest District Karimnagar (A.P.) India. The species is mainly distributed in tropical regions of India, especially in the lower hills of the Western Ghats (Singh *et.,al* 2005). The plant is bitter, sweet, refrigerant, carminative, aperients, vulnerary, expectorant and tonic and it is useful in vitiated conditions of pitta, burning sensation, dyspepsia, flatulence, colic, constipation, ulcers, cough, asthma and vertigo (Sowndhararajan *et.,al* 2010). Futher it is reported to have the

properties viz., antirheumatic, antiflatulent, antiinflammatory, anticancer, antidiabetic, diuretic and stomachic also (Raja *et.,al.* 2005). Sequeezed plant is applied to treat scabies of animals. The root is chewed for 15 minutes to relieve toothaches (Raja *et.,al.* 2010). The leaf extract is shown to have hepatoprotective immunomodulatory effect and antiarthritic activity (Jayathilaka *et.,al.* 1990). Decoction of seeds in sudorific, crushed and applied on aching bodies, especially on stained backs (Nair 2002).

In natural communities, the species is present with very low population size which may be due to its failure or less efficient sexual and vegetative reproductions (Mallikadevi 2011). Hence, the present study was undertaken to develop a suitable micropropagation technique to counteract the natural check in its population, and hence to meet the demand. The main objective of the present investigation is to select the best *in vitro* responding media combinations for inducing morphogenesis in higher frequencies and optimization of conditions for complete plantlet development.

## MATERIALS AND METHODS

### Aseptic seed germination explants preparation and culture conditions

Seeds of *Melothria maderaspatana* (L.) M.Roem. were obtained from the Eastern division of Mahadevapur Reserve Forest District Karimnagar (A.P.) India. These seeds were washed in running tap water for three minutes and then washed repeatedly in double distilled water. Now under aseptic conditions the seeds were surface sterilized with 70% ethanol for one minute followed by a twenty minute treatment with 2% sodium hypochloride and washed with sterilized triple distilled water five times followed by 0.1% Mercuric chloride ($HgCl_2$) for five minutes and rinsed five times in sterile distilled water. The sterilized seeds were then placed on MS basal medium (Murashige and Skoog 1962) solidified with 0.8% bacto agar for germination in 250 ml culture bottles,20 seeds were cultured per bottle containing 30 ml of medium. This was incubated in dark at 26$^{o}$C till it germinated and then transferred to cool-white-fluorescent light room and incubated at 24+2$^{o}$C and allowed to grow. The plant after reaching a height of 6 centimeters was taken in an aseptic condition and cotyledon and Leaf were excised using a sterile scalpel and cut into 6-8 mm sections.

### Plant Regeneration

The seedling excised (cotyledon and Leaf) explants (Fig –I a) were then placed on MS medium containing 3% w/v sucrose with various concentrations of cytokinin TDZ (1.0-5.0

mg/L), Kn (1.0-5.0 mg/L) alone and also in combination with auxin IAA (0.5mg/L) + TDZ (1.0-5.0 mg/L), and IAA (0.5mg/L) + Kn (1.0-5.0 mg/L) (Tables- 1) the pH of the media was adjusted to 5.8 + 1 with I N HCl or 1N NaOH solidified with 0.8% difco –bacto agar and autoclaved at 121$^{o}$C at psi for 15-20 minutes single explants was inoculated in each culture tube and incubated at 25 + 2$^{o}$C under white fluorescent light of 40-60 µ mol m-2 s-1 intensity for 16 hrs light /8 hrs dark period. Every two week the explants were transferred to fresh medium. The number of shoots produced was counted 6 weeks after culture. Isolated single shoots after reaching 5 centimeters in size were transferred to MS medium (Murashige and Skoog 1962) supplemented with (1.0 mg/L) IAA/IBA for rooting. Plantlets were transferred to the greenhouse for acclimatization and growth.

**RESULTS AND DISCUSSION**

Multiple shoot buds proliferation was observed within 15-20 days of culture form the cut ends of cotyledon and hypocotyls. The data on *in vitro* regeneration was presented in (Table –I)

**Effect of TDZ and KN**

Table 1 represents, direct regeneration of seedling Cotyledon and Leaf explants to various concentration of cytokinins such as TDZ and Kn alone in TDZ (1.0 -5.0 mg /L) and Kn (1.0-5.0 mg/L) was studied on direct multiple shoot bud induction. Direct adventitious shoot regeneration on MS medium containing various results. Highest responding cultures with maximum frequency of multiple shoot bud induction was observed at (3.0 mg/L) TDZ (3.0+ 0.27 shoots/explant) (Fig –I b) followed by 4.0 and 5.0 mg/L TDZ, produced (2.8+0.38 and 2.6+0.32 shoots/explants )with 50 and 48% cultures responding. The numbers of shoots were considerably reduced, when TDZ concentration was increased. Kn was less responsive compared to TDZ in inducing shoot buds from the explant with 1.0 mg/L Kn the cotyledon explant produced (1.7+0.43 shoots/explants) and 50% culture responded 3.0 mg/L Kn was more responsive in inducing maximum number of shoots (2.8+0.35 shoots/explants ) with greater frequency (58%) Kn at 4.0 and 5.0 mg/L Produced (2.4+0.22 and 2.0+ 0.45 shoots/explants) with 52 and 49% cultures responded.

Leaf explants were cultured on MS medium supplemented with various levels of TDZ (1.0-5.0 mg/L) Maximum frequency of shoot buds induction (2.8+0.32 shoots/explant) was noted at (3.0 mg/L) TDZ compared to all other concentration tested shoot capacity was gradually decreased at high concentration of TDZ (Table-1). Similarly Leaf explants were cultured on MS

**Table-1 Effect of TDZ, Kn, IAA+TDZ and IAA+Kn on direct shoot induction from cotyledon and Leaf explants on MS medium of *Melothria maderaspatana* (L.) M.Roem.**

| Cotyledon | | | Leaf | |
|---|---|---|---|---|
| **Hormone** | **% of** | **Average number of** | **% of** | **Average number of** |
| **TDZ** | | | | |
| 1.0 | 55 | 2.0±0.35 | 53 | 1.8±0.32 |
| 2.0 | 60 | 2.2±0.25 | 57 | 2.0±0.43 |
| 3.0 | 65 | 3.0±0.27 | 62 | 2.8±0.32 |
| 4.0 | 50 | 2.8±0.38 | 52 | 2.4±0.36 |
| 5.0 | 48 | 2.6±0.32 | 47 | 2.3±0.32 |
| **Kn** | | | | |
| 1.0 | 50 | 1.7±0.43 | 48 | 1.3±0.34 |
| 2.0 | 56 | 2.1±0.34 | 50 | 1.8±0.32 |
| 3.0 | 58 | 2.8±0.35 | 53 | 2.2±0.36 |
| 4.0 | 52 | 2.4±0.22 | 47 | 2.0±0.32 |
| 5.0 | 49 | 2.0±0.45 | 42 | 1.6±0.42 |
| **IAA+TDZ** | | | | |
| 0.5+1.0 | 60 | 2.6±0.48 | 58 | 2.3±0.43 |
| 0.5+2.0 | 68 | 3.0±0.75 | 65 | 2.8±0.22 |
| 0.5+3.0 | 70 | 3.8±0.36 | 68 | 3.0±0.23 |
| 0.5+4.0 | 65 | 3.2±0.32 | 62 | 2.6±0.33 |
| 0.5+5.0 | 58 | 2.8±0.42 | 56 | 2.0±0.63 |
| **IAA+Kn** | | | | |
| 0.5+1.0 | 58 | 2.2±0.42 | 56 | 1.2±0.32 |
| 0.5+2.0 | 62 | 2.0±0.32 | 59 | 1.4±0.36 |
| 0.5+3.0 | 68 | 2.3±0.42 | 65 | 1.8±0.23 |
| 0.5+4.0 | 60 | 1.8±0.32 | 62 | 1.3±0.33 |
| 0.5+5.0 | 50 | 1.6±0.32 | 59 | 1.0±0.33 |

***S.E. Standard Error**

medium supplemented with various levels of Kn (1.0 -5.0 mg/L). Highest percentage (53%) of responding cultures were observed at (3.0 mg/L) followed by (4.0 mg/L) and gradually reduced

as the level of Kn was increased. Maximum number of shoots regeneration (2.0+0.32 shoots/explant) was found at (4.0 mg/L) Kn. whereas the shoot bud induction was decreased at high level of Kn.

**a** **b**

**Figure1: Direct shoot induction of cotyledon and Leaf culture of** *Melothria maderaspatana* (L.) M.Roema) *in vitro* seedling after 30 days of seed culture b)Direct shoots on (3.0mg/L) TDZ from cotyledon culture c) Multiple shoots on IAA(0.5mg/L)+(3.0mg/L) TDZ from Leaf culture d)Direct shoots formation on IAA(0.5mg/L)+TDZ(3.0mg/L) from cotyledon Cotyledon explants after six weeks

**Effect of IAA +** TDZ **and IAA + Kn**

When the auxin was taken in combination with IAA (0.5 mg/L) + TDZ (1.0 -5.0 mg/L) and IAA 0.5 mg/L + Kn (1.0-5.0 mg/L) (Table-1) in combination produced shoots from the explants. At (0.5 mg/L) IAA with (1.0 mg/L) TDZ 60% cultures responded with (2.6 + 0.48 shoots / explants) maximum number of shoots (3.8+ 0.36 shoots/explant) with greater frequency 70% were produced at (3.0 mg/L) TDZ + IAA (0.5 mg/L) (Fig –I c) As the concentration of TDZ was increase from (4.0 mg/L) to (5.0 mg/L) the number of shoots were considerably reduced (Table -1). IAA + Kn was less responsive compared to IAA + TDZ in including shoot buds from the explants (Table -1) with (1.0 mg/L) Kn and (0.5 mg/L) IAA produced (2.2+0.42 shoots/explants) with 58 % cultures responded. At 3.0 mg/L Kn was more responsive in inducing maximum number of shoots (2.3+ 0.42 shoots) with greater frequency (68%) Kn at 4.0 and 5.0 mg/L produced (1.8+ 0.32 and 1.6+ 0.32 shoots/explants) with 60% and 50% cultures responding. To find out the efficiency of auxin – cytokinin combination the Leaf explants were cultured on MS medium supplemented with IAA (0.5 mg/L) in combination with various concentration of TDZ /Kn (1.0 -5.0 mg/L). Direct shoot bud proliferation was found in all the concentrations and combinations of phytohormones used.

Leaf culture on MS medium containing (0.5 mg/L)IAA in combination with (1.0-5.0 mg/L) TDZ showed maximum responding culture and more number of shoots /explants (3.0+ 0.23 shoots /explant) (Fig –I d) at (3.0mg/L) TDZ. Average number of shoots production has been gradually decreased at high concentration of TDZ (Table -1). Leaf explants were cultured on (0.5 mg/L) IAA in combination with various concentration (1.0,2.0,3.0,4.0 and 5.0 mg/L) of Kn showed (1.2+ 0.32,1.4+ 0.36, 1.8+ 0.23,1.3+ 0.33 and 1.0+ 0.33 shoot/explant) with 56, 59, 65,62 and 59% responded. For root induction, individual microshoots (8.00 cm) were placed on MS medium supplemented with various concentrations of IAA (1.0mg/L). The *in vitro* produced plantlets showed about 60% survival in Soil rite. After 4-5 weeks, the regenerated.

**DISCUSSION**

We were successful in regeneration plants from, cotyledon and Leaf culture of *Melothria maderaspatana* (L.) on MS medium fortified with different concentration of cytokinin ie TDZ/KN individually and also in combination on with (0.5 mg/L) IAA. Maximum number of shoot buds were induced (3.0 mg/L) TDZ in comparison to Kn as a role growth regulators with low levels of auxin (0.5 mg/L) were added to the medium containing TDZ /Kn it was interesting to find that the shoot induction was enhanced in all the concentrations of cytokinin tested. However the shoot bud proliferation was found to be more on (0.5 mg/L) IAA in combination with TDZ /Kn to probably IAA might have triggered the action of TDZ /Kn in a proper way for inducing more number of shoots per explant but the combination of IAA + TDZ induced higher number of plantlet regeneration among all hormonal combinations and concentrations used.

The present findings from *Melothria maderaspatana* (L.) demonstrate the possibility of the *in vitro* propagation of cucurbits through cotyledon and Leaf explants to obtain plantlets with uniform growth characteristics of the mother plant, direct regeneration is essential. Literature on cucurbits indicates a low rate of regeneration and survival of plants with abnormalities such as premature flowering (Gambley and Dodd 1990). Regeneration from cotyledon, sections of hypocotyls and apical buds with varying regeneration frequency has been reported by Gambley and Dodd (1991). Similarly Hoque *et. al.,* (2005) have reported the high frequency of plant regeneration on MS medium containing (2.0 mg/L) BAP in combination with (0.5 mg/L) IAA from cotyledon derived callus in *Memordica dioica.* They have also found the maximum number of shoots per explants on BAP compared to Kn. The essentially to both auxin cytokinin combination for inducing shoot organogenesis has been reported in leaf culture of *Cicer ariutum* (Arockia Swamy *et. al.* 2000) of the cytokinin used BAP proved as most effective than Kn in inducing shoots, the same finding were recorded in *Capsicum* spp (Phillips and Hubsten berger 1985). Our results show enhanced shoot formation by proliferation of Cotyledon and Leaf on a medium fortified with cytokinin and auxins. The fortification of cytokinin for multiple shoot induction at lower concentrations has also been reported (Kathal *et. al.* 1988; Singh *et. al.* 1996). It is concluded that the manipulation of culture conditions using various combinations and concentrations of growth hormones and other adjuvants can provide a reproducible protocol and reduce the high costs of hybrid seed production.

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# MEDICINAL PLANTS SURROUND US

Lecturer in P.G Botany, Govt.Degree & P.G College,Siddipet, Medak (D),A.P.

Principal,Vignan Junior College,Tandur, R.R (D),A.P.

puttarupareddy@yahoo.comarrollachandrashekarreddy@yahoo.com

**ABSTRACT**

Medicinal plants play significant role in existence, better living and welfare of human being. Medicinal plants also enhancing social, economical, developmental, nutritional, medicinal, traditional and spiritual status of human being. India is rich of medicinal herbs. In India specially rural people, from ancient period to till now wild and cultivated plants which are surround them using as medicinal plants to cure various ailments like cold, cough, headache, stomach pain , indigestion, constipation, fever, teeth problems, dog bites , snakebites, ear problems, skin infections, burns, bone fractures, chicken pox, mumps, paralysis , jaundice and irregular menstruation**…etc.**

Medicinal plants have primary and secondary metabolites , show medicinal properties like anti fungal ,anti bacterial, anti inflammatory, anti amoebic, anti diabetic, anti helminthic, anti cancerous, anti dote, anti periodic, antipyretic anti sterility…etc. So herbal medicines are preparing by extraction of metabolites of medicinal plants. Medicinal plants like aloe vera, tulasi, turmeric, neem, badam, brungaraj …etc use as herbal cosmatics.

For rural medicinal practices whole plant or parts of the plant like root, rhizome bark, leaves, flowers, fruits, seeds are using.Commonly using medicinal plants are tulasi ,neem , amla,datura, vavili, rudracksha, maraudu, bilva, tephrosia, dhaniya, zeera, brungaraj,turmeric, ginger, garlic, ashoka, billaganneru, tella jilladu, erra jilladu velaga,glory plant, fenugreek, pudina.vempali,pepper,andrographis, nelapala…etc.

Key words ;- medicinal plants, indigestion, paralysis, tulasi, herbal cosmatics.

**INRODUCTION:**

From ancient period to modern era, plants have been source of medicine. India is a treasure of a wide variety of medicinal plants. Both wild and domesticated medicinal plants have

become a part of traditional home remedies to cure different ailments like cold, cough, headache, stomach pain, ear pain, jaundice, body pains, constipation, fever, dog bite, snake bite, teeth problems burns, cuts, diabetes...etc. Many plants are extensively used in various medicinal practices like ayurveda, siddha, unani, homeopathy…etc due to their active compounds like alkaloids, steroids, flavonoids, terpens…etc

**History:-**

The knowledge of medicinal plants begun with origin of human being. In ancient period the primitive man acquired the knowledge of medicinal plants by observing of animals, birds…etc .He found that few herbs were eaten by animals that made unhealthy animals as healthy. From that time he started using, gained knowledge by trial and error method and that passes on from one generation to next generations.

In India the importance of medicinal plants mentioned in our Vedas likes rigweda and atharvanavedha about 3000years B.C. Later about 900 B.C the classical ayurveda works like charkas samhitha and susrutha samhitha gave an account of 700 medicinal plants description and their curative properties. Later during Buddhist period universities at Varanasi and at Thakshasela were established to teach the traditional medicine.

Later ayurveda and siddha spread throughout the country very rapidly. But later the traditional medicinal practices were discouraged and suppressed due to the British ruling. Later these are rejuvenated after India got independence. During modern era due to westernization, easy availability, lake of knowledge about medicinal plants made man step towards English medicines but people not completely far away from traditional medicines. From last pair of decade to till now the research programs on medicinal plants have been conducting and making the awareness of medicinal plants by using of print media , electron media, social media and orally.

**Content:-**

Most of the plants have medicinal properties like anti fungal ,anti bacterial, anti inflammatory, anti amoebic, anti diabetic, anti helminthes, anti cancerous, anti dote, anti periodic, anti pyretic, anti sterility…etc. for medicinal practices the whole plant are part of plant

are using. Majority of the people depend on surrounding plants instead of synthetic medicines especially for rural medicine. Commonly using medicinal plants are tulasi ,neem , amla,datura, vavili,rudracksha,maraudu,bilva,tephrosia,dhaniya,zeera,brungaraj,turmeric,ginger,garlic,ashoka, billaganneru,tellaljilladu,errajilladu,velaga,gloryplant,fenugreek,pudina.vempali,pepper,andrographis,nelapala,.moduga,vasa,gurivinda, uttarani,tummi…etc.

**Few of the medicinal plants description & their curative properties are given below.**

**Ocimum Sps:-**

| | | |
|---|---|---|
| Ocimum americanum | Tel: - kukka tulasi | Eng: - Hoary basil |
| Ocimum grattissimum | Tel: - Ramatulasi | Eng:-Lemon basil |
| Ocimum sanctum | Tel: - krishnatulasi | Eng: - Monk's basal |
| Ocimum basillicum | Tel: - Rudrajada | Eng: - Sweet basil |

- Leaves are used to cure cold cough bronchitis, diabetes and also used as mosquito repellent.
- The fresh leaf juice used to cure ringworms, earache, toothache, indigestion.
- Seeds are cooling agent, and carminative.
- Soaked seeds used to escape from sun stroke.

**Azadirachta indica**

Tel:-Vepa Eng: - Neem

- Bark is used to cure skin problems, antiseptic and hepato protective.
- Leaves are used to treat ulcers, eczema, jaundice and chicken pox.
- Flowers are used to cure wounds and stomachache.
- Fruit is purgative.

- Seed oil used to cure worm infection, leprosy and skin problems.

**Phyllanthus Sps**

Phyllanthus acidus Tel: - Rachausiri Eng: - Country goose berry

Phyllanthus amarus Tel: - Nela usiri

Phyllanthus emblica Tel: - Usiri Eng:-Indian goose berry

- Whole plant is used to cure jaundice, diabetes, eye diseases, also used as astringent.
- Young roots are used as snake repellent.
- Fruit is rich of vitamin-C, used to cure diabetes, diuretic, cough, hair tonic, mouth freshener, and indigestion.
- Dried fruits used to cure anemia and jaundice.
- Recent researches discovered amla has reduced cancer cell growth.

**Datura Sps:-**

Datura arborea Tel: - Pedda Ummetta

Datura innoxia Tel: - Tella ummetta Eng: - Thorn apple

Datura metal Tel:-China ummetta

Dathura stremonium Tel: - Ummetta Eng: - Tim son weed

- Root is used as snake repellent.
- Seeds are antispasmodic
- leaves are used to cure asthma, swellings and wounds

**Vitex Sps:-**

Vitex negundo Tel: - Vavilli Eng: - Negundo, Indian privet

Vitex penduncularis Tel: - kada vavilli Eng: - Glandular''s peacock foot

- Bark of vitex is used to cure malaria
- Leaves are used as antibiotic and cure fever, headache, cancer and pain relief.
- Fruit is used as anti helminthes and digestive.
- Flower is used to cure diarrhea.

**Aandrigraphis paniculata**

Tel: - Neelavemu Eng: - King of bitter

- Dried leaves and tender shoos used to cure debility and skin diseases.
- Decoction of the whole plant used as blood purifier and also used to cure jaundice and fever
- Young shoots and leaves used to cure cancer and aids also.

**Asparagus racemosus: -** Tel: - Pillithegallu

- Tuberous roots are used to treat eye problems , dysentery , nervous problems, liver and kidney disorders.
- Dried root powder increases lactation in nursing mothers.
- Shathawarin drug make physical strength and youth fullness.

**Gymnema sylvestes:-**

Tel:-Madhu nashini Eng:-Australian cow plant

- Leaves are used to cure diabetes.
- Decoction of roots and leaves used to cure cough, fever, and headache and heal the wounds.
- Leaf powder increases urination.

Leaves and black pepper paste used to reduce poison of snake bites.

**Tephrosia Sps:-**

Tephrosia callophylla Tel: - Aadavi vempali Eng:- Tephrosia maxima

Tephrosia purpura Tel: - Vempali Eng: - Wild indigo

- Roots are used to cure diabetes, cough and urinary disorders.
- Whole plant is used to cure ulcers and fever.
- Pods are used for vomiting

**Eclipta prostrate or Eclipta alba:-**

Tel:- Guntagalagara Eng: - Prickly leaved elephant foot.

- Whole plant is used to cure dandruff and worked as hair tonic.
- Whole plant is hepato protective.
- Leaves are used to cure jaundice, cancer and rejuvenator.
- Seeds are used to cure eye irritations.

**Polyalthia longifolia**Tel:-Onti komma ashokam Eng:-Mast tree

- Stem bark used to cure joint pains, constipation, fever, and snake bite.

**Tinospora cardifolia:-**

Tel:- Tippateega Eng:-Guduchi

- Root is used to cure leprosy.
- Stem is used to cure anemia, jaundice, diabetes and fever.
- Leaf juice is work as health tonic.
- Whole plant is used to cure digestive problems.

**Cleome Sps**:-

Cleome viscose Tel:- kukka vominta Eng:-Sticky cleome

Cleome gynandra Tel:- Vominta Eng: - Spider flower

- Leaves are used to cure headache
- Seeds are used to cure joint pains.

**Abutilon indicum**

Tel:- Thutturubenda Eng: - Crab's eye.

- Leaves are used to cure piles ulcers cough jaundice and diabetes.

**Hibiscus cannabinus** Tel: - Gongura Eng: - Red sorrel

- Leaves are used to cure boils.
- Flower is used to cure hyper acidity.

Hibiscus mutabilis Tel:- Mirapa mandara Eng: - Cotton rose.

- Leaves are used to treat cough and burns.

**Hibiscus rosa sinensis**

Tel:- Mandara Eng: - Shoe flower

- Leaves are used to cure headache and fever.
- Flowers are used to cure diabetes and worked as hair tonic.

**Tribulus terrestris:-**

Tel:- Pallaru Eng: - Pancturevine

- Root and fruits are used to cure diabetes, asthmas and cardiac diseases.
- Whole plant is used to cure retention of urine, thirst, and hepato protective.

**Oxalis corniculata:-**

Tel:- Pulichinta Eng: - Indian sorres

- Leaves are used to make chutney and used to cure anemia, piles, cancer and warts.

**Clitoria ternata:** -

Tel: - Adivichikudu Eng: - Butter fly pea.

- Roots are laxative, diuretic, headache and ulcers.
- Leaves are used to cure diabetes, dog bites and earache.

**Pongamia pinnata:-**

Tel:-kanuga

- Root is used to cure paralysis and ulcers.
- Bark is used to cure night blindness.
- Flower is used to cure diabetes
- Seeds are used to cure eczema and snake bites

**Indigifera tinctoria:-**

Tel: -- Neeli Eng: - Indigo plant

- Root is used to cure hepatitis.
- Root and leaves are used to cure jaundice, anemia and worm infections.

**Pakinsonia aculeate:-**

Tel:- Seema tumma Eng: - Horse bean.

- Whole plant is used to cure Parkinsonism.

**Acacia nelotica:-**

Tel:- Nalla tumma Eng:-Black babul

- Stem bark is used as mouth freshner.
- Fruits, seeds and gum used to cure ulcers, cough wounds and diabetes.

**Mimosa pudica:-**

Tel: - Attipatti Eng: - Touch me not plant

- Root and leaf used for diabetic patients.
- Whole plant used to make abortion.

**Aerva lanata: -Tel:-**Pindikurra

- Roots are used to cure diabetes, and abdominal pain.
- Whole plant is used to dissolve kidney stones.

**Euphorbia hirta:-**

Tel:- Nelapala Eng: - Snake weed

- Whole plant is used to cure urinary disorders, constipation asthma and cough.
- Leaves are used to cure bowl problems.

**Achyranthus asparas: -**

Tel: - Utarani Eng: - Rough chatt tree.

- Whole plant is used to cure jaundice, scorpion sting, anemia, earache and teeth ache.

**Abracus precatorious:-**

Tel:- Gurivinda

- Seed powder is used to cure white discharge in women.
- By applying of dry seed powder with honey can control the bald head.
- Application of fresh leaves juice to cure the mouth ulcers.
- Application of dryseed powder , gee, can cure the back pain and joint pains

**Butea monospermae:-**

Tel:-Moduga Eng:-Flame of the forest.

- Fresh leaves juice with salt used as lice killer.
- Bark can control the menustrual problems.

**Ceiba pen tandra** Tel:-Buruga Eng: - White silk cotton tree

- Application of paste of bark can reduce the pimples
- Mixer of Bark powder, jiggery, dhaniya powder controls the constipation.
- Decoction of bark powder and flower is best remedy for kidney stones.
- Teeth ache can control by use of gum.
- Dry seed powder with honey controls the cough.
- Pimple creams are preparing by using of bark.

**Acorus calamus: -**

Tel:-Vasa Eng: - Sweet flag

- The smoke of burnt leaves control the asthma.
- Decoction of leaves controls the stomachache

- Raw juice of leaves control the cough and fever
- Leaves with honey control indigestion

**Aegle marmelos**: -

Tel:-Bilva Eng: - Beal fruit trees, golden apple

- Raw leaf juice with honey cures the fever.
- Fruit juice cure the constipation
- Leaf juice cure the skin disorders
- Root juice cure the diabetes
- Vomiting in pregnant ladies crue by taking of fruits.

**Conclusion**: -

India is treasure of various types of medicinal plants, making of the awareness about medicinal plants and conservation of them also necessary for future existence.

# STUDIES ON ETHNO-MEDICINAL PLANTS OF MAHADEVPUR RESERVE FOREST EAST DIVISION KARIMNAGAR DISTRICT (A.P.) INDIA

**Srinivas.A[1], Srinivas.T[1], Buchaiah.K[1], Chandraiah.G[3], Anitha Devi.U[2]and Ugandhar.T[1]**

[1]Department of Botany, S.R.R.Govt Degree & P.G.College Karimnagar

[2]Department of Botany Govt Degree & P.G.College for Women Karimnagar

[3]Department of Botany, S.K.N.R.Govt Degree College Jagityal

***E-mail:tugandharbiotech@gmail.com**

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## ABSTRACT

Plants are an integral part of nature and the nature reflects the creativity of God. The plants are designed with a specific purpose. They are the life sustaining force on the earth. In Mahadevapur Forest percentage of the population still prefers to use herbal medicines along with modern medicines. The region is mostly inhabited by rural and native communities. Tribal cultures hold much ethno botanical information, and rural and native communities regularly use medicinal plants for treatment of diseases, wounds, fractures and other ailments. In the present study it was found that total 50 plant species were used by the rural people for their various ailments. Medicinal values of these plants are largely based on folk practitioners. The study stated that either the whole plant or different parts like leaves, stem, bark, roots, etc. are used.

***Key Words:*** *Mahadevapur, Ethnobotanical, Folk practitioners, Ailments.*

## INTRODUCTION

It is believed that about 15-17 million species are present on the earth planet. Out of which only 5 million have been described so far. Interestingly, 70% of them occur in tropical and sub tropical parts of the world (Krishnankutty and Chandrasekaran, 2007). In India, more than 43% of the total flowering plants are reported to be of medicinal importance (Pushpangadan, 1995). Utilization of plants for medicinal purposes in India has been documented long back in ancient literature. However, organized studies in this direction were initiated in 1956. Right from its beginning, the documentation of traditional knowledge especially on the medicinal uses of plants, has provided many important drugs of the modern day (Anon, 1994).

The tribal knowledge regarding the use of plant species for various purposes depend on the surrounding plants (Reddy *et al*., 2010). Plants and other living organism have great potential to treat human diseases (Subbu and Prabha, 2009). Ethnobilogy came in to being when the

earliest man observed the animals mostly the apes and monkeys eating certain plants and found heal his wounds and get rid from pain and suffering. An analysis of such observations provoked them to use of plants for maintenance of life and alleviation of diseases (Sinha, 1999). Despite of new advances in medicine, the cultural use of plant in traditional medicine continues from primeval time to this day all over the world. World Health Organization has estimated that 80% of the people in the world rely on traditional medicines for primary health care needs (Fransworth, 1990). It was also realized that till now only 5% of the herbal wealth was studied whereas the rest remained unexplored (Arya *et al*., 2008).

Medicinal plants are gaining popularity because of several perceived advantages, such as fewer side effects and better patient compliances (Brown *et al*., 2008). Today the medicinal world is posed with complex challenges. Thus time demand an integrated and pluralistic approach towards health care to cope effectively with his situation (Sen and Batra, 2008). Establishment of herbal forms in well selected localities will exercise scientific control over the cultivation of medicinal herbs (Kritkar and Basu, 1987). In every ethnic group there exists a traditional health care system, which prevalent and popular among community (Rai, 2007). The conservation and protection of medicinal plants against over exploitation by domestic and foreign commercial interest without benefits accruing to the nation are clearly our priorities (Natesh and Mohan Ram, 1999). The traditional healers of Shekhawati region of Rajasthan having a commendable knowledge of the medicinal values of plant that grow around them (Katewa and Galav, 2005). In the various regions of Mahadevapur Reserve forest of different plant species are the major source of local medicine for their ailments.

Information on folk medicinal uses of the plants has recently become of renewed interest in search for new therapeutic agent. Vast knowledge on medicinal plants exists as oral among the folklore and primitive societies of India, where a large number of potent medicinal herbs are found growing wild. Although, a great amount of Ethno botanical research work has been undertaken in various pockets of tribal and rural population scattered throughout the country, there is still much to be discovered. Ethno botanical explorations play vital role in bringing to light information about such plant species from our rich flora that can be source of safer and cheaper potent drugs for the benefit of mankind. In country like India, according to reasonable estimates, 70 percent inhabitants still rely on herbs (Singh, 1997).

## MATERIALS AND METHODS

### *Study Area*

Mahadevapur is the one of Reserve forest of Karimnagar District of Telangana region of Andrapradesh. Mahadevapur Reserve forest is situated in the Northern Telangan Region and occupies 13th place in respect of area of 11884.5sq km which account for 4.33''of the total Area of of the state. Karimnagar District is located between latitude 80.0'' and $19^0$.00'' North and Longitudie 78.$^0$30' and $80^0$.31' East. It is bounded out the North by Adilabad District on the North West by Nizamabad District on the West by Medak District on the South by Warangal District and East by River Godhavari It has 57 Mandal including Eligaid as 57 Mandal Karimnagar has got 5 Revenue Division Namely Karimnagar Division Jagityal Division Huzurabad Peddapally Division & Manthini Division. Among these Divisions Manthini Division is largest in area but least population as most of the area is covered by forests hills including Ramagiri Quila and the river Godhavari which flows about 40 Kms along boarder.

The Reserve Forest Block of Mahadevpur and Compartments covered during the Field Survey are 1). RF Block Mahadevpur Beat, Beersagar Compartment No: 241, 242, and 247. RF Block Mahadevpur Beat, Prathapgiri Compartment No: 193, 199, and 200. 3). RF Block Mahadevpur Beat, Pulgula Compartment No: 260. 4). RF Block Mahadevpur Beat, Nusturpally Compartment No; 208, 218. 5). RF Block mahadevpur Beat, Annaram Compartment No; 246, 250, and 251. 6). RF Block Mahadevpur Beat, Kundurpally Compartment No: 226 and 239. Total area potential MPCA (Medicinal Plants Conservation Area) identified in twenty (20) Ha Villages visited. 1), Kundurpally. 2). Edapally. 3). Beerasagar. 4). Kannepally. 5). Prathap Giri. 6). Marripally. 7). Chidenepally. 8). Sandrupally. 9). Annaram 10). Puskupally. 11). Maddulapally. 12). Nagepally. 13). Elkeshwar. 14). Rapally Kota. 15). Nasthurpally. 16). Kaleshwaram. 17) Mahadevpur. The Kaleswaram is a religious pilgrimage centre in which Lord Shiva Temple is located on the river bed "Godavari and it is flourished with rich flora of the thick forest. So also, the Prathap Giri is a Historical place, as which was under the reign of the "King-Prathapa Rudra Deva" of the old Orugal, Warangal AP, India. This hill area is a beautiful site for many medicinal plants to be explored. Mahadevpur area is a dense forest and flourished with many green canopies. Taxonomically, it is the best site and a reserve resource of plant identification and collection studies.

Local medicine men and health practitioners interviewed 1). Sri Mondi, Mahdevpur. 2). Sri. Gadi chandraiah, Mahadevpur. 3). Sri Kaveri Chandraiah, Kudurupally. 4). Sri Gadi Chandraiah, Beersagar. 5). Sri. Peddi mallaiah, Kaleshwaram. They explained the following 40 plants as detailed.

**TABLE-I: Percentage of the species of Medicinal Plants Identified:**

| Trees | Shrubs | Climbers | Herbs | Dominant | Rare | Threatened |
|---|---|---|---|---|---|---|
| **30%** | 20% | 10% | 40% | 80% | 12% | 08% |

**RESULTS AND DISCUSSION**

The Forest of Mahadevpur belongs to Karimnagar East Division are very rich in Medicinal plants and 95% of them grow naturally. This is due to the combined effects of the geographical situations and its topography. We worked on the medicinal plants available in this area, which given interesting and encouraging results. All the specimens were examined and compared with flora of key herbarium. The medicinal uses given by the medicine men were cross checked with the ancient compilations like, Bhava Prakasha Nighantu, Dhanvanthari Nighantu, Indian Medicinal plants Nadkarni, and Indian Materia medica-Kirthikar and Basu and detailed in the following

**1) *Acacia catechu* Family Name: -** Fabaceae

**Uses:** - The heart wood and bark of the tree are used in traditional medicine. A wood extract called catechu is used in traditional medicine for sore throats and diarrhea. The concentrated aqueous extract, known as khayer gum or cutch, is astringent. It is used in Ayurvedic medicine. In ayurveda , it is used for rasayana ( rejuvenation treatments). It is also used for its actions like anti-dyslipidemic, anthelminthic, anti-inflammatory, anti-diuretic,anti-pruritic, coolant, taste promoting, enhancing digestion and curing skin disorders.

**2*). Acorus calamus* L. Family Name: -Araceae**

**Uses: -** A root decoction is taken as a tonic. Fresh rhizomes are taken to cure diarrhoea, relieve gastritis and as a poison antidote. The plant contains a number of chemically interesting compounds including terpenes, flavone diglucoside, sterol and vitamin C. Traces of the alkaloid gramine have been detected in the leaves.

**3). *Agave Americana Linn* Family Name: - Agavaceae**

Uses:- The sap of agaves is antiseptic, diaphoretic, diuretic and laxative and used internally for the treatment of diarrhea and dysentery. An infusion of the chopped leaf is purgative and the juice of the leaves is applied to bruises.

**4).*Ageratum conyzoidesi* Family Name:- Asteraceae**

**Uses: -**The seeds are used in the treatment of diarrhea while, leaves cure boils, cuts, headache, leprosy, piles, scabies and other skin diseases.

**5). *Aloe vera* Family Name: - Liliaceae**

**Use: -**Acid inside *Aloe vera* is used as effective pain killers. Antiseptic made from Aloe vera is used to kill mold, bacteria, funguses and viruses. *Aloe vera* uses include help in skin blemishes. Acne is treated by *Aloe vera* gel and it's really effective. *Aloe vera* also helps in stopping baldness. *Aloe vera* is used for enhancing skin growth. Important *Aloe vera* uses include relief from cuts, bruises and burns. When we Aloe vera being a medicinal plant have various uses in the medicine field, its proving to be very important in curing many of the skin diseases and research are on the going process to explore more options of *Aloe vera* uses to cure the most acute and severe diseases. From centuries *Aloe vera* is used for healing cuts and bruises. Total skin care and curing topical sores of diabetics patient is the main use of *Aloe vera* uses includes cosmetics benefits and uses as beauty restoring things.

**6). *Aloe ferox* (Cape Aloe) Family Name: -Liliaceae**

**Uses: -** The sap of the leaves can be used as a wound dressing. The leaf juice is used to treat burns and to rid dogs and cattle of internal and external parasites. The juice of the leaves is a strong purgative for both humans and animals. A delicious preserve (konfyt) can be made from the leaves. Today the Cape Aloe is found in various forms such as pills and gels. It is commercially important as a laxative and is used in several popular mixtures.

**7). *Albizia lebbeck* L. Family Name: - Fabaceae**

**Uses :-** Lebbeck is an astringent, also used by some cultures to treat boils, cough, to treat the eye, flu, gingivitis, lung problems, pectoral problems is used as a tonic, and is used to treat abdominal tumors. The bark is used medicinally to treat inflammation. This information was obtained via ethno botanical records, which are a reference to how a plant is used by indigenous peoples, not verifiable, scientific or medical evaluation of the effectiveness of these claims.

**8). *Annona squamosa* L. Family Name:-Annonaceae**

Uses: - 1) A bark decoction is used to stop diarrhea, while the root is used in the treatment of dysentery.

**9). *Aristolochia indica* L Family Name:- Aristolochiaceae**

**Uses: -** The roots are used in the treatment of diarrhea, dropsy, hypertension, menstrual complaints, scabies and skin diseases.

**10). *Aerva lanatai* L.Family Name:-Amaranthaceae**

**Uses: -** The whole plant, especially the leaves, is edible. The leaves are put into soup or eaten as spinach or as a vegetable. The plant provides grazing for stock, game in and chickens.

It gives protection against evil spirits, is a good-luck talisman for hunters, and safeguards the well-being of widows.

**11). *Asparagus racemosus* Family Name:- Liliaceae**

**Uses: -** Used for improving functional efficiency of all organs of body. Root used as aphrodisiac.

**12). *Azadirachta indica* Juss Family Name: - Meliaceae**

**Use:-** The leaves are used in blood purification, boils, cold, diarrhea, dysentery, malaria, scabies, tuberculosis, while bark is used in curing liver complaints, jaundice and skin diseases.

**13). *Boerhavia diffusa* Family Name: -**Fabaceae

**Uses: -** *Boerhavia diffusa* is believed to improve and protect eyesight *B. diffusa* has diuretic properties and is used by diabetics to lower blood sugar. *Boerhavia diffusa* has shown antibacterial activity, mainly against Gram-negative bacteria. Extracts of *B. diffusa* leaves have shown antioxidant and hepatoprotective properties in pharmacological models. Punarnavine (an alkaloid isolated from *B. diffusa*) has shown some *in vitro* anticancer, antiestrogenic, immunomodulatory, and antiamoebic activity (particularly against *Entamoeba histolytica*). *Boerhavia diffusa* is a source of antioxidants, and may be effective against arsenic trioxide (an effective drug used against acute promyelocytic leukemia) induced cardio toxicity it's also possess cardioprotective properties

**14). *Calotropisgigantean* Family Name:- Asclepiadaceae**

**Uses: -** Asthma, body ache, boil, burns, dropsy, dysentery, leprosy, ringworm and other skin diseases. Asthma, boils, cholera, cold, cough, rheumatism, ringworm, small pox, stomach disorders, toothache and swelling

**15). *Carica papaya* L. Family Name: -(Caricaceae)**

**Uses: -** A root decoction is taken as a means of birth control and for uterine contractions after childbirth.Similar decoction is used to prevent menstruation. The fruits contain ascorbic acid, papain, pectin, carotene, xanthine, carpene, mallic acid, essential oils and 5-hydroxytryptamine alkaloid.

**16). *Cassia fistula* L. Family Name:- Caesalpiniaceae**

Uses: - The pulp of the seed pod is used as a mild laxative. Fruits are used in curing asthma, chest infection, constipation, cough, diarrhea and dysentery.

**17). *Centella asiatica* (L). Family Name: -(Umbellifereae)**

Uses: - Teas of the plants are taken for hypertension and diarrhoea, as well as for urinary tract infections. The dried herb is used as adetoxicant, diuretic and to lower blood pressure and decrease heart rate. The plant contains fatty acids, sterols and alkaloids.

**18). *Catharanthus roseus* Family Name: - Apocynace**

Uses: - Whole plant is used in curing diabetes, while the leaves are used during body swelling. FolkloricIn the Philippines, decoction of leave susedin diabetes Decoction of young leaves used for stomach cramps. Root decoction for intestinal parasitism asemmenagogue may produce abortion in fusion of leaves used for treating menorrhagia Crudelea fextracthas anticancer activity.

**19). *Curcumalonga* Family Name Zingiberaceae**

**Uses:** - It has been reported to possess antibacterial, anti-fungal and anti-inflammatory activities the part used are rhizomes and it contains curumin (diferuloyl methane), turmeric oil or turmerol & 1, 7-bis, 6- hepta-diene-3, 5- Dione. Curcumin has potent anti-inflammatory and analgesic activities. Volatile oil isolated from *C. longa* also exhibits antibacterial & potent anti-inflammatory activity.

*Curcuma longa* also contains protein, fats, vitamins (A, B, C etc) all of which have an important role in would healing and regeneration.

Turmeric has been used for treating the wounds in the rats. The presence of vitamin A & proteins in turmeric result in the early synthesis of collagen fibers by mimicking fibroblastic activity. Juice of the fresh rhizome is commonly applied to recent wounds, bruises & leech bites.

A paste of turmeric & leaves of *Justica adhatoda* with cow urine is rubbed on skin affected with prurigo & eczema. It can also be mixed with ginger oil to prevent skin eruptions.

**20). *Daturainoxia* Family Name: -Solanaceae.**

**Uses: -** *Datura inoxia*, like other Datura species, contains the highly toxic **alkaloidsatropine**, hyoscine (scopolamine), and **hyoscyamine**.

- The Aztecs called the plant toloatzin, and used it long before the Spanish conquest of Mexico for many therapeutic purposes, such as poultices for wounds where it acts as an anodyne. Although the Aztecs warned against madness and "various and vain imaginings", many native Americans have used the plant as an entheogen for hallucinations and rites of passage.
- The alkaloids of these plants are very similar to those of mandrake, deadly nightshade, and henbane, which are also highly poisonous plants used cautiously for effective pain relief in antiquity.
- Datura intoxication typically produces a complete inability to differentiate reality from fantasy (delirium, as contrasted to hallucination); hyperthermia; tachycardia; bizarre, and possibly violent behavior; and severe mydriasis with resultant painful photophobia that can last several days. Pronounced amnesia is another commonly reported effect.

**21). *Emblica officinalis*Family Name: - Euphorbiaceae**

**Uses***:* richest source of Vitamin C and is a fruit is the diuretic, aperient, Laxative and hair dye. It cures insomnia and is healthy for hair.

- It is used as the cardio protective, useful in hemorrhage, menprrhagia, leucorrhoea and discharge of blood from uterus.
- Amla power and oil are used traditionally in Ayurvedic applications for the treatment of scalp.
- Amla power improves immunity and gives physical strength. It improves complexion and removes wrinkles.
- Amla is also used to treat constipation and is used as a cooling agent to reduce the effects of sun strokes and sunburns.

**22). *Ficusbenghalensis* Family Name:-Moraceae**

**Uses: - :** According to Ayurveda, it is astringent to bowels; useful in treatment of biliousness, ulcers, erysipelas, vomiting, vaginal complains, fever, inflammations, leprosy. According to Unani system of medicine, its latex is aphrodisiac, tonic, vulernary, maturant, lessens

inflammations; useful in piles, nose-diseases, gonorrhea etc. The aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver etc.

**23). *Ficus racemosa* L Family Name: - Moraceae**

Uses:- The leaves are used in the treatment of blisters, boils, diarrhea, dysentery, piles and urinary complaints, while fruits are used in curing diabetes, leprosy and stomach disorders.

**24). *Ficusreligiosa* Family Name:-Moraceae**

**Uses:-** *Ficus religiosa* is used in traditional medicine for about 50 types of disorders including asthma, diabetes, diarrhea, epilepsy, gastric problems, inflammatory disorders, infectious and sexual disorders.

**25). *Gloriasa superb* Family Name:-Colchicaceae.**

**Uses: -** The alkaloid-rich plant has long been used as a traditional medicine in many cultures. It has been used in the treatment of gout, infertility, open wounds, snakebite, ulcers, arthritis, cholera, colic, kidney problems, typhus, itching, leprosy, bruises, sprains, hemorrhoids, cancer, impotence, nocturnal emission, smallpox, sexually transmitted diseases, and many types of internal parasites.

It is an anthelmintic. It has been used as a laxative and an alexiteric. The sap is used to treat acne and head lice. In a pregnant woman, it may cause abortion. In parts of India, extracts of the rhizome are applied topically during childbirth to reduce labor pain.

**26). Hemidesmus *indicus* Family Name: -Asclepiadaceae**

**Uses:** The bark of Indian Elm is used in rheumatism. Seed and paste of stem bark is used in treating ringworm. Bark and leaves are used for treating oedema, diabetes, leprosy and other skin diseases, intestinal disorders, piles and sprue.

**27). *Hibiscus rosa-sinensis* L Family Name:-(Malvaceae)**

**Uses: -** Pounded leaves, with a little salt, are applied as a paste to cuts, swollen fingers, boils and sprains. Sap from shoots is taken for asthma. Crushed flowers are squeezed onto boils and as poultice for wounds and swelling.

**28). *Indigofera* L. Family Name:-Fabaceae**

Uses:- Several species of this group are used to alleviate pain. The herbs are generally regarded as an analgesic with anti-inflammatory activity, rather than an anodyne. *Indigofera articulata* (*Khedaish* in Arabic) was used for toothache, and *Indigofera oblongifolia* was used as an anti-inflammatory for insect stings, snakebites, and swellings. *Indigofera suffruticosa* and *Indigofera*

*aspalthoides* have also been used as anti-inflammatories. A patent was granted for use of *Indigofera arrecta* extract to relieve ulcer pain. The Maasai people of Kenya use parts of *Indigofera brevicalyx* and *I. swaziensis* as toothbrushes.

**29). *Justicia adhatoda Linn*  Family Name:- *Acanthaceae***

Uses: - 1) The plant is used for treatment of various ailments of respiratory tract, cough and bleeding piles.

2) Inflorescence and leaf liquid is used for fever.

**30) *Mentha longifolia* (Longleaf mint, Balderja) Family Name: -:-(Laminaceaea)**

**Uses:-**The strong-smelling leaves can be rubbed onto the skin to ward off mosquitoes or to help heal wounds. A tea made from the leaves is used to treat a number of conditions including fevers, headaches, indigestion, menstrual pains and colic.

**31) *Mimosa pudica* L. Family Name: -(Leguminosae)**

Uses: - A root decoction is taken to ease headache or dizzy spells. A paste of the whole plants is applied to cuts and wounds. A root decoction is taken to relieve asthma and diarrhoea.

It is also used to treat neurosis and has a tranquilising effect. A decoction is used externally on wounds and hemoptysis and used as a sedative. The roots contain the alkaloid mimosine as well as sitisine and related alkaloids.

**32).*Morinda citrifolia* L. Family Name: -(Rubiaceae)**

Uses; - Decoctions of roots or barks are taken to treat hypertension or gastric ulcer. Root decoctions are drunk to regulate menstruation and the fruits are chewed to prevent tooth decay. The plant is also used to treat hypertension. The root contains a trihydroxyantra quinone methyl ether.

**33). *Ocimum santum* Family Name: -(Laminaceaea)**

**Uses: -** The tulsi or holy basil is an important symbol in the Hindu religious tradition and is worshipped in the morning and evening by Hindus at large.

- Tulsi has antioxidant properties and reduces blood glucose levels. Thus it is useful for diabetics.

  Tulsi reduces total cholesterol levels. Thus it is useful for heart disease patients. Tulsi reduces blood pressure.
- Tulsi is also used to prepare herbal tea

- ❖ It helps in building up stamina It has been used for gastric disorders, cough, common colds, malaria, headaches It is used as mouth was hfor reducing toothache
- ❖ Tulsi oil shows larvicidal activity against malarial larva It has immuno-modulatory properties It contains phyto-chemicals which provide all these beneficial effects.
- ❖ Many herbal cosmetics contain tulsi. It is also used in skin ointments due to its anti-bacterial properties. Oi lextracted from Karpoora Tulsi is used in these preparations.

**34). *Piper betle* L. Family Name: -(Piperaceae)**

Uses:-Leaf tea is taken for coughs. Pounded leaves are turned into a paste and applied to cuts, boils and scabies.

The warmed leaves are used to stop nosebleed. Leaves contain antibacterial substances and many types of essential oils.

**35). *Rauwolfia serpentine*. Family Name: -(Apocynaece).**

Uses:- Drug reserpine and serpentine is used for curing high bloodpressure, mild anxiety,mental illness.Root is also used as anthelmintic ans as antidote to snake venom.

**36) *Sennaauriculata* Family Name: -Fabaceae**

**Uses:-**This plant is said to contain a cardiacglucoside (sennapicrin) and sap, leaves and bark yield anthraquinones, while the latter contains tannins.

- ❖ The root is used in decoctions against fevers, diabetes, diseases of urinary system and constipation.
- ❖ The leaves have laxative properties. The dried flowers and flower buds are used as a substitute for tea in case of diabetes patients.
- ❖ It is also believed to improve the complexion in women. The powdered seed is also applied to the eye, in case of chronic purulent conjunctivitis.
- ❖ In India the bark and seeds are said to give relief in rheumatism, eye diseases, gonorrhea, diabetes and gout.

**37). *Syzygium cuminii* (L.) Family Name: - Myrtaceae**

**Uses: -** The fruits are used in the treatment of digestive troubles, stomachache; bark cures piles; and seeds heal pimples.

**38) *Withania somnifera* Name: - Solanaceae**

**Use:-** Leaf poultices are applied externally to wounds, haemorrhoids, abscesses and syphilis. An infusion of the roots is used to treat asthma, colds, fever and influenza. The medicinal use of this

plant is extensive and ranges from an insecticide and sedative to an anti-aging treatment and memory enhancer. Roots used is sexual and general weakness. Forms an important ingradient of 31 energy capsules.

**39). *Woodfordia fruticosa*(L.) Korz. Family Name: - Lythraceae**

Uses: - It is used for dysentery, diarrhea, cough, injuries, nausea and sprain. It has been used as an astringent to treat dysentery and sprue, and also for the treatment of bowel complaint, rheumatism, dysuria and hematuria in many South East Asian countries. It is also an ingredient of a preparation used to make barren women fertile. It has recently proved to be a rich storehouse of chemical constituents with promising anti-tumor and anti-inflammatory activities as revealed in modern biology-based studies. Investigations in progress may identify new molecules with anti-peptic ulcer activities and confirm the usefulness of traditional remedies to develop new herapeutics.

**40). *Zingiber officinale* Rosc.** Family Name:-**(Zingiberaceae)**

**Uses: -** Powdered rhizomes with a little alcohol are used to massage sprains, muscle pains or rheumatism. Rhizomes contain a variety of essential oils including borneol, camphene, chavicol, cineol, citral, geraniol, gingerin, gingerol, linalool, vinillyl alcohol, zingerone and zingiberene.

The above Forty species belong to twenty genera belonging to Twenty Eight families is employed in different ailments by the tribal people of Mahadevapur Reserve Forest of Telangana Region of India. It is seemed that the Leguminosae family came into the first position in treating the children, and the field survey is also envisaged the same. In the country like India, where the death rate of children, particularly in rural areas, is much higher than the other developed countries in the world. Hence the scope of this type of study is very promising and important and it may give new source of drug plants in pediatric diseases.

**CONCLUSION**

Due to indiscriminate exploitation and lack of Conservation a number of valuable plants have become vulnerable. To avoid this, it is necessary to educate the local public and conserve the existing vegetations by way of various methods of propagation and involving the water shed committees in these programmes. Also it is needed for the cultivation, processing and conservation of rare and threatened medicinal plants, through appropriate methods to meet the developmental task.The present study of medicinal plants at Mahadevpur Reserve Forests of

Karimnagar East Division was taken up to document the diversity of medicinal plants available and to formulate the strategy for conservation and development of medicinal plants.

In Mahadevapur Forest, the plant communities have been largely disturbed due to deforestation for fuel, over consumption of medicinal resources for the treatment of diseases, population explosion, increased tourism and other environmental hazards. Due to indiscriminate cutting, not only the forest area is declining but valuable indigenous species are in danger and if this inclination continues, the ultimate result would be the extinction of these species from the area. Hence, direct conservation measures as proposed below are urgently required in order to protect the taxon from extinction. These include,

(i) Proper documentation and conservation of indigenous knowledge need to be done,

(ii) Appropriate training of the local communities about the conservation and sustainable utilization of medicinally important flora needs to be given,

(iii) Overgrazing and deforestation should be abridged,

(iv) Permanent monitoring programs should be developed,

(v) Natural gas should be introduced in the area as an alternate fuel source,

(vi) Promote forest management practices that benefit biodiversity conservation,

(vii) Proper health facilities should be provided to local people, and

(viii) Awareness programs at grass root level should be introduced.

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# AGROBACTERIUM MEDIATED GENETIC TRANSFORMATION IN *SOLANUM SURATTENSE* BURMA.F (FROM LEAF EXPLANTS)

***UGANDHAR.T[1], AYSHWARYA.E[1], SAMMAIAH.D[2], ANITHA DEVI U[3]. AND RAMASWAMY N[4]**

[1]Department of Botany, SRR Govt. Arts & Science College Karimnagar 505001 (A.P.) India.

[2]Department of Botany, Govt Degree College Huzurabad.- 505498

[3]Department of Botany, Govt. Degree &P.G.College for Women Karimnagar -505001 (A.P.) India.

[4]Department of Biotechnology, University College Kakatiya University Warangal -506009 (A.P.) India

***E-mail:ugandharbiotech@gmailcom.in**

**Abstract**

Genetic transformation studies have been carried out in *Solanum surattence* Burma.f through *Agrobacterium tumefaciens* mediated transformation of mature healthy leaf explants were selected from *in vitro* grown plants for the present experiment. The explants were cultured over night on a one-day-old feeder layers. These overnight cultured leaf explants were co-cultivated with *A.tumefaciens* strain LBA 4404 harboring a binary vector containing the B-glucoronidase (GUS) and neomycin phosphor transferase (Npt-*11*) genes. The leaf explants were transferred to selective regeneration medium. The explants began to regenerates 3 weeks after transformation and Kanamycin resistant shoots have been developed. Shoot developed after transformation showed the GUS assays. Amplified DNA fragment was produced in PCR using N-11 specific primer and DNA from the transgenics. The transgenic plants were also confirmed using southern blotting technique. The efficiency of protocol and role of *Agrobacterium* mediated transformation in crop improvement will be discussed.

**KEYWORDS** *Agrobacterium, b-glucuronidase (GUS)* Kanamycin, Cefotoxime, Transgenic *Solanum surattense* .

## INTRODUCTION

*Solanum surattense* Bum. (Solanaceae) is a perennial herb. It is usually found in India, Pakistan, Malaya, and Australia. In Bangladesh, it was found as wild herb in almost all northern

parts and it was very common in the Barind region. Nowadays, this plant rarely gets in the Barind region only. The solasodine and glycosides are rich in this plant, are very common properties for anti-cancer (Cham, 2007). Besides, this plant is widely used as folk medicine for breathing trouble, heart diseases and pain. Some drug companies (Unani, Hamdard Laboratories, Ayurvedic) are developed in India based on plant extract and they are attracted by the people. These companies are using extract of *S. surattense* as to prepare remedy for breathing disease; as well this plant is widely planted in highland of India. Since this herb becoming a potential medicinal plant in south Asia, more advance investigations are needed concerning modification of characteristics including rapid growth, increase essential chemicals content, disease resistant and stress tolerance in this plant. Limited reports have been published on the *in vitro* propagation as well as genetic transformation systems of *S. surattense*. Pawar *et. al.* (2002) developed a technique for direct shoot organogenesis from shoot tip and leaf segments. Using nodal and shoot tip segments, a micropropagation technique also established on this plant by Rama Swamy *et al.* (2004). Rama Swamy *et al.* (2005a) established a protocol on plantlet regeneration through somatic embryogenesis from cotyledon and leaf explants. Callus induction and shoot organogenesis system from floral bud were also reported earlier for this plant proliferation (Prasad *et al.*, 1998). Rama Swamy (2006) reported *Agrobacterium*-mediated genetic transformation systems using cotyledon explants of *S. surattense*. (Rama Swamy *et al.* 2005b) established streptomycin-resistant *S. surattense* plantlets using *in vitro* mutagenesis.

For genetic improvement of plant, we usually use selection method as well as *in vitro* molecular breeding technique. Plant breeders showing great interest on molecular breeding technique for plant modification genetically because conventional selection method takes long time, tedious and occurs large variation within clones. For molecular breeding based genetic transformation, we know, efficient regeneration systems are prime requirement. Stem segments are used as important explant for genetic transformation system, described in many plant species (e.g., Rastogi and Dwivedi, 2006).

In some countries, the highest percentage of the acreage of some economically important crops is transgenic; an increasing number of these transgenic varieties are or will soon be generated by *Agrobacterium-mediated* transformation (Gelvin, 2003). Due to the wide host range *Agrobacterium* mediated genetic transformation is very popular method for introducing gene of interest into plant. *Agrobacterium tumefaciens* as a gene vector is limited to soybean (Hinchee *et*

*al.,* 1988, broad bean (Jelenic *et al.,* 2000), sesame (George *et al.,* 1987) and sunflower (Weber *et al.,* 2003). *Brassica* is also a suitable host for *Agrohacterium* spp. (Godwin *et al.,* l991; Toriyama *et.al.,* 1991). So, the non-oncogenic *Agrobacterium* strain as a vector (Lin dsey, 1992) can make possible to transfer desired gene in *Brassicu.* Still now, a little success in genetic transformation has been reported in oil crop due to their recalcitrant *in vitro* condition (Nisbet and Webb, 1990). The main problem about the *Brassica* is that, the transformed tissues (callus) are not regenerable and the regenerable tissues (meristematic tissues) arc not transformable.

Considering all issues, the objectives of the present study was to develop a reproducible any efficient protocol for the insertion of molecular genes into *S. surattence* through *Agrobacterium tumefaciens* vectors and to standardize the periods of pre culture and co-cultivation required for transformation and to analyze the putative transgenic plants using histochemical *GUS* assay.

**MATERIALS AND METHODS**

Seeds of *S. surattence* collected from the plant grown in the research field. Department of Botany Kakatiya University. Dried mature seeds were soaked in sterile distilled water for 24 hours and sterilized with 0.1% (w/v) aqueous $HgCl_2$ for 3-5 minutes followed by washing 3 times with sterile distilled water. Later these were dried on sterile on sterile tissue paper under laminar-flow hood 20 seeds per culture bottle were germinated aseptically on Ms basal medium containing 3%(w/v) sucrose and 0.8%(w/v) agar. These culture bottles were incubated at 25 ± 1 0 C under 16 h photoperiod. Light was provided by cool white fluorescent tubes with an intensity of 50-60 Leaf explants from 30 day old seedlings were used for transformation experiments.

**BACTERIAL STRAIN:**

The *Agrobacterium* strain used was LBA 4404 harbon ring a binary plasmid PBIN 19 which has a npt II (Neomycin photo transferase II ) gene and a vid A (gus gene). The *Agrobacterium* strain was grown on Lury and Bertani (LB) medium plates containing 5.0 gm/L NaCl, 10 gm/L Bactotryptone, 5 gm/L Yeast Extract and 100 mg/L Kanamycin and the pH was adjusted to 7.0 and solidified with 7 gm/L Difco/Bacto Agar.

**TRANSFORMATION AND PLANT REGENERATION:**

For co-cultivation two colonies from a freshly streaked plate were transferred to 10 ml of Liquid LB medium. *Agrobacterium* strain LBA 4404 was grown at $28^{o}$ C overnight in LB liquid

medium containing 100 mg/L Kanamycin(KM} with shaking (approx. 250 rpm). Kanamycin was added since the binary vectors are not completely stable in *Agrobacterium* in the absence of antibiotic selection for transformation, the hypocotyls explants were submerged and gently shaken in the *Agrobacterium tumefaciens* suspension for about 10 minutes and blotted dry on a sterile filter paper. Afterwards, they were transferred to shoot regeneration (SR) medium containing MS salts (0.5 mg/L) IAA+(3.0 mg/L) BAP for hypocotyl explants and co cultivated under 16 hr. photo period of 50-60 µmol m-2 S-1 For 3 days at 25 ± 2$^{o}$C. After co-culture, the explants were washed in the MS liquid medium blotted dry on a sterile filter paper and transferred to the freshly prepared selective SR medium (MS1) supplemented with antibiotics 200 mg/L cefotoxime and 100 mg/L Kanamycin.(Table-1) Simultaneously a control was also maintained. After 4 weeks, the growing shoots were excised from the primary explants and sub cultured in fresh proliferation selective medium containing 100 mg/L KM (MS2). The green healthy shoots from explants were subjected to 2-3 passages of selection by repeated excision of branches and their exposure to selective elongation medium (MS2).The green shoots were transferred to MS medium containing (0.1 mg/L) with Kanamycin (100 mg/L) for root induction (Table-2). (Fig I B, C and D)

**CULTURE CONDITIONS AND DATA ANALYSIS:**

All the cultures were incubated at 25± 2$^{o}$C and 16 hr. /8 hr photoperiod under 50-60 µ mol m-2 S-1 white fluorescent light. All the experiments were carried out in 10 replicates. The experiments were replaced at least 3 times, keeping all the Parameters unchanged.

**HISTOCHEMICAL GUS ASSAY**

The histochemical GUS assay was carried out according toStaining was done by placing the tissue into X-gluc, staining buffer in a small vessel, X-Gluc stock was prepared by dissolving X-Gluc 20 mg/ml in Dimethyl Sulphoxide (DMSO). To make 1 ml of staining buffer 0.85 µl sterile distilled water was mixed with 100 µl monosodium PO4 (pH-7), 5 ml of X-Gluc stock and 5 µl Triton X-100 in an eppendoraff tubes. The sample was incubated overnight at 37$^{o}$C. Later these explants were treated with aceto alcohol (1:3 v/v) mixture to remove chlorophyll and then fixed in 70 % ethanol. The tissues were examined under stereomicroscope for the evidence of blue cells. X-glucuronide (5-bromo-4- chloro-3-indolyl glucuronide) is colorless but the indoxy product derived after glucoronidase activity undergoes oxidative dimerisation to from an insoluble indigo blue (Fig I A)

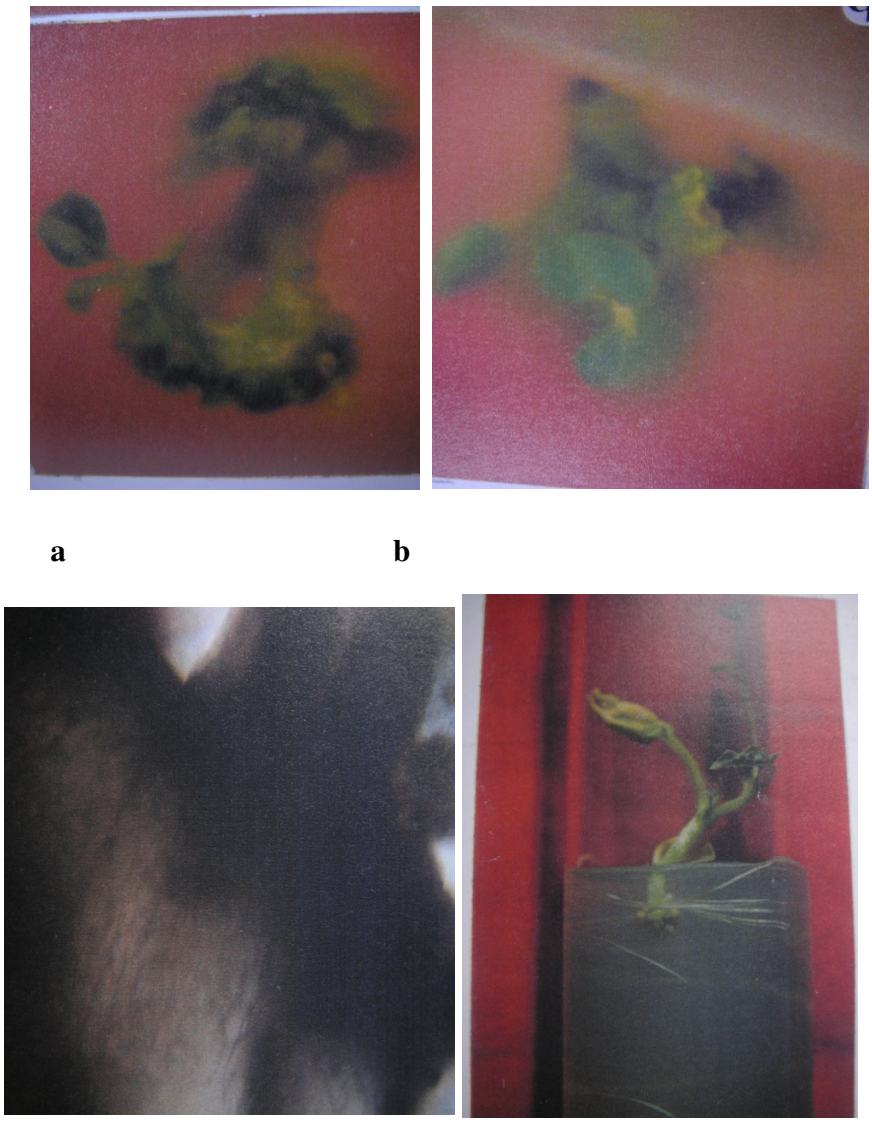
**RESULTS**

We have standardization the plant regeneration in *S. surattence* from leaf explants using. MS medium supplemented with 0.5 mg/L IAA+3.0 mg/L BAP. The combination was routinely

**TABLE-1. Successive growth media used for the transformation and selection of Transgenic shoots from Leaf explants of *S.surattense***

| Sl No | Steps and Components of Media | MS 1 Medium | MS 2 Medium |
|---|---|---|---|
| 1 | Time for *Agro bacterium tumefacience* Inoculation) | 8 minutes | - |
| 2 | Co-cultivation with *Agro bacterium tumefacience* | 2 minutes | - |
| 3 | Proliferation of shoots | ---------- | 4-5 Weeks |
| 4 | Kanamycine selection and shoot regeneration | ---------- | 6-7 Weeks |
| 5 | MS salts gm / L. | 4.5 | 4.3 |
| 6 | Sucrose gm / L | 25.0 | 3.0 |
| 7 | Hormone mg/L. | IAA+BAP (0.5)+(3.0) | IAA+BAP (0.5)+(3.0) |
| 8 | Cefotaxime mg/L. | --------- | 200 |
| 9 | Kanamycine mg / L. | --------- | 100 |
| 10 | pH | 5.8 | 5.8 |
| 11 | Agar-Agar gm/L | 8.0 | 8.0 |

used for the present transformation experiments. The explant (leaf) co-cultivated with *Agrobacterium tumefaciens* formed shoots 6 weeks of culture on selective shoot regeneration medium (MS1). The control explants which were not co-cultivated did not produce when cultured on MS1 medium indicating the effective level of Kanamycin (100 mg/L) (Table-2).



**a** **b**

c d

Figure 1: Plant regeneration from leaf explants of *S.surattense* transformed with gus gene
A) Blue colour formation on selection medium with 100 mg/ L kanamycin

B) Shoots elongated from the kanamycin resistant from leaf explants after 4 weeks of Culture.

C) GUSexpression in transformed tissue (developing shoots after 6 weeks of culture.

D*) In vitro* rooting from Kanamycin resistant micro shoots after 8 weeks of culture.

**TABLE-2 Successive growth media used for the transformation and selection of Transgenic shoots from Leaf explants of *S.surattense***

| Explant | Strain | No of Explants Culture | Explants Bleached | Explants with callus shoots | Mean No of Shoots/Explants (S.E}* |
|---|---|---|---|---|---|
| **Leaf**** | **___** | **40** | **-----** | **3.0±1.0** | **7.3±0.3** |
| **Leaf** | **LBA4404** | **40** | **15** | **15±03** | **2.3±2.0** |

*** Mean ± Standard Error, ** on normal regeneration Medium**

Kanamycin sensitivity of leaf explants was assessed prior to *Agrobacterium* transformation to determine the concentration of Kanamycin needed for effective growth of transgenic plants. At (50 mg/L) Kanamycin caused chlorosis and eventual necrosis in all explants by the end of the fourth week. Whereas concentrations of (75 mg/L) and (100 mg/L) Kanamycin completely inhibited the formation of shoot buds. In the present study higher concentration of Kanamycin (100 mg/L) was used for selection of transformants to prevent possible escapes.

High percentage of cultures producing green shoots was observed in leaf explants (Table-2). After four weeks the growing green shoots (Fig I B) from MS1 medium were excised and transferred into MS2 medium for proliferation.

The transformed shoots were multiplied by culturing on MS2 medium containing 100mg/L kanamycin to confirm the stability of the transgenic shoots. Leaf explants from transgenic plants when cultured on shoot regeneration medium containing kanamycin showed the plant regeneration thus the stability was also achieved by leaf strip assay.

Most of the transgenic clones appeared morphologically normal in comparison with the untransformed plants. The putative transformed shoots which attained 2-3 cm in length were excised and then transferred to the MS3 medium for rooting (Fig I D)

The leaves from transgenic shoots were subjected to in situ GUS assay ((Fig I C). The expression of uid a gene was verified by histochemical staining of the leaf of the transgenic plants. The npt II positive regenerants showed the typical indigo blue colouration of X-Glue treatment while the untransformed ones didn't show GUS activity. Also, more than 33% and 27% of the regenerants from leaf explants respectively were Gus positives. These results clearly demonstrate the stability of the transformed plants.

**DISCUSSION**

We have achieved the successful genetic transformation mediated by *Agrobacteriumtumefaciens strain* LBA 4404 which has a binary vector pBIN 19 derivative with an intron containing GUS gene. The successful transformation was also reported in a number of *Solanaceous* species *Solanum melongena* (Flippone and Lurquin, 1989: Rotino and Gleddie, 1990; Leon *et al.,* 1993; Fari *et. al.,* 1995) *S.sismbrifolium* (Rao *et al.,* 1997) *S.muricatum* (Atkinson and Gardner, 1991), *S.tuberosum* (Sheerman and Bevan, 1988); *Lycoperiscon esculentum* (Hood *et.al.,* 1986a) *Capsicum annum* (Liu *et.al.,* 1990); *Nicotina tobacum* (Hood *et.al.,* 1986) and produced transgenic plants.

Transformation efficiency was found to be higher in other *Solanaceous* plants. This transformation efficiency is dependent on various factors type of explants, size, explants orientation on selective regeneration medium, gelling agent and plate sealed and the frequency of transfer to fresh selective medium. Frary and Earle (1996) have examined the effect of various factors on efficiency of *Agrobacterium*–mediated transformation in *Lycopersicon esculentum* cv. Money maker using cotyledon and hypocotyls explants. Mc Cormick (1991) has reported that the leaf explants were more efficient in generating transgenic shoots as observed in the present investigations. Whereas Liu *et al.,* (1990) has reported that the transformation efficiency was higher in leaf followed by hypocotyls and cotyledon explants and also noted the same differential response between the *A.tumefaciens* strains C58 and A281 used in bell pepper. The strain C58 showed more transformation efficiency compared to A281 in all the explants co-cultivated. Although most published protocols report the use of whole cotyledons as explants (Davis *et. al.,* 1991; Mc Cormick, 1991; Van Rockel *et. al.,* 1993), cutting cotyledons into two or three pieces

(depending) on their size is recommended as a way to maximize the number of transformants obtained from a minimum number of seedlings (Fray and Earle, 1996). Armstead and Webb (1987) found that cotyledons of *Lotus corniculatus* were more readily transformed than leaves from seedlings grown *in vitro.* Young leaves were transformed more frequently than old leaves. However, leaves from old papaya plants were found to be more easily transformed than cotyledons or leaves from young plants (Pang and Sanford, 1988).

*Agrobacterium*- mediated genetic transformation efficiency is not only genotype dependent but also varies with the strains used. The stable integration of GUS and NPT II genes in *Mentha arvensis* and *Mentha spicata* has been achieved by *A. tumefacies* mediated gene transfer. Differences in transformation efficiency between *M.spicata* and *M. arvensis* became apparent in the percentage of explants producing kanamycin resistant (Km R) calli for the two *Agrobacterium* strains used. *M. spicata* explants produced 53% KmR calli with GV 2260/GL and 71% with EHA 105/MOG whereas 5% and 1.2% *M.arvensis KmR* calli were obtained respectively with GV 2260/GI and EHA 105/MOG (Diemer *et. al.,* 1991) reported the difference in degree of transformation caused by three different *A. tumefaciens* strains, pTi-A6 related plasmids (i.e., those in A6 and A66) have less expression of *vir* genes than pTiBO 542 plasmids (i.e., those in strain A 281). Hussain *et.al.,* (1997) also reported in two varieties of Chick pea (6153 and CM72), *Agrobacterium* strain A281 was found to be more efficient in transformation than C58.strain A281 was found to be more efficient in transformation than C58.

Schroeder *et. al.,* (1993) reported that presence of growth regulators in the co-cultivation medium enhanced transformation frequency in *Pisum.* Venkatachalam *et.al.,* (2000) have also found an important factor for efficient transformation in *Arachis hypogaea* was the 2-day pre culture of the cotyledon explants, which probably served to reduce wound stress and increased the number of competent cells at the wound site. Similar results were also reported in other species by Muthukumar *et. al.,* (1996).

Davis *et. al.,* 1991 have studied the effect of tomato cultivar, leaf age and bacterial strain and density of bacterial inoculum on transformation by *Agrobacterium tumefaciens* and reported the variation in transformation frequencies based on those factors. Plant cultivar was also found to have an 85-fold higher transformation rather than another (Eapen-Kohler *et. al.,* 1987).

Petunia nurse cell culture technique also enhances the efficiency of *A.tumefaciens* mediated transformation. Recently, Rama Swamy *et. al.,* (2001) have reported the high

transformation efficiency (96%) with petunia nurse cell suspension feeder layer culture compared to without feeder layers in leaf discs of *Nicotiana tobacum* cv. Sunsun. Acetosyringone (AS) is a phenolic compound released by wounded cells and it plays an important role in the natural infection of plants by *A. tumefaciens* as it activates the virulence genes of the Ti-plasmid and initiates the transfer of the T-DNA region to the plant DNA. Exogenous addition of AS in the medium has shown to increase Ti transformation frequencies with *Allium cepa, Antirrhinum majus, Arabidopsis thaliana, Atropa belladonna, Brassica compestris, Glycine mad, Nicotiana tabacum* and pickling cucumber (Mathews *et. al.,* 1990; Godwin *et. al.,* 1991; Holford *et. al.,* 1992; Sarmento *et. al.,* 1992). Frary and Earle (1996) have also reported the enhanced transformation in tomato when the explants (cotyledons and hypocotyls segments) co-cultivated in the presence of AS showed the npt II gene more efficient expression than control transformants. Furthermore, regeneration efficiency from transformed explants of *Solanum melongena* was enhanced by using growth regulators, such as TDZ and antibiotics like augmentin (300 µ g/ml) (Billings *et. al.,* 1997).

Agronomically important characters have been genetically engineered in major crop plants using *Agrobacterium* mediated genetic transformation. Hinchee (1988) first time achieved the successful recovery of transformed Soyabean plants for engineering herbicide resistance. After words, this transformation technology was used for introducing agronomically important traits for improvement of the crop in the following species using *Agrobacterium:* sugar beet (*Herbicide tolerance* –D'Halluin *et. al.,* 1995), cotton (Insect resistance, Herbicide tolerance – Umbeck 1987), Papaya (virus resistance – Fitsch *et. al.,* 1993), poplar (Herbicide resitance – Filatti, 1988), Potato (Insect resistance, virus resistance, herbicide tolerance, - Van den Elzen *et. al.,* 1995), and tomato (Delayed ripening (increased shelf life), virus resistance – (Sanders *et. al.,* 1992; Redenbaugh *et. al.,* 1993; Reed *et. al.,* 1995). Kemper *et. al.,* (1992) have developed the transgenic *Arabidopsis thaliana which* are methatrexate resistant due to integration of T-DNA vectors containing a Chimeric dihydrofolate redudctase gene. Lawrence and Koundal (2001) have developed the transgenic pigeonpea resistant to chewing insects mainly pod borers using *Agrobacterium tumefaciens* strain GV 2260 containing the construct of isolated cowpea protease inhibitor gene (pCPI).

The Indian Council of Agricultural Research (ICAR) has developed biotech plant types of cotton, brinjal and tomato and now working on evolving similar plants of rice, chickpea an

pigeon and thus, over 35 genetically improved plants created this way. Trials have also been going on in various laboratories to introduce important traits such as herbicide tolerance, virus, abiotic stress and disease resistance including "nif" genes in cereals viz., maize, sorghum and oryza using this *A. tumefaciens.*

After transfer of the gene of interest using *A. tumefaciens* the transgene expression is also an important one. The trasgene expression in transgenic populations can vary due to dominant effect exerted by neighbouring plant sequences such as enhancers and silencers may also influence the activity of the introduced genes. Breyene *et. al.,* (1992a) have studied the influence of the T-DNA configuration on inter – transformant expression variability of a reporter gene. The transcriptional interference can diminish the activity of a gene located downstream in opposite orientation (Ingelbrecht *et. al.,* 1991). Breyene *et. al.,* (1992a) have introduced an additional *3'nos* region between the transgene and the RB (right border) in such an orientation that it would stop possible trancscripts coming from the flanking plant DNA. The presence of *3'nos* resulted in transgenic population with 1.5 to 2-fold higher mean *gus 'A'* proximinity of the '35S' enhancer sequences to 'Pnos' results in an increase of *gus'A'* expression. Other molecular causes such as the local DNA structure and / or the higher- order chromatin arrangement (Breyene *et. al.,* 1992 b) possibly also have an important role in the overall level of gene expression.

In view of the importance of *A. tumefaciens* mediated genetic transformation; the protocol which was developed during the present studies can be utilized to transfer genes of interest for genetic improvement of medicinally important herb *S. surattense.*

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# MULTI ROLE MULBERRY

A.SRINU, Lecturer in sericulture Govt. degree and PG college, Bhadrachalam

srisatcrl@gmail.com

Mulberry forms the basic food material for silk worms and the bulk of the silk goods produced in the world are from mulberry silk worms. Mulberry belongs to the genus MORUS. Morus is the Latin word. Mulberry includes a no of species (nearly 20) and varieties. Mulberry plant is exploited in different ways for commercial production of silk, as mulberry in the chief food for Bombyx mori. Mulberry leaf protein is the source for the silk worm to biosynthesize the silk which is made of two proteins, fibroin and sericine. Nearly 70% of the silk proteins produced by a silkworm is directly derived from the proteins of mulberry leaves. Mulberry is grown as a bush in tropical countries and as middling's and trees in temperate countries. Mulberry is believed to be a native either of India or China and it is believed to have originated on the lower slopes of Himalayas towards, the year 2800BC. A global survey of sericulture industry reveals that there are at least 29 countries where mulberry is cultivated. Mulberry contains different chemicals of medicinal value in leaf, fruit, stem, seed and root portions. The chemical substances are normally extracted in aqueous media in form decoctions and concoctions.

**Role of mulberry**:

Mulberry is truly a multipurpose plant. Its foliage for silkworm rearing fruits for food industry and beverages and applications in various industries like pharmaceutical and medical surgery, beauty care, cosmetics etc. mulberry is a source of food (human consumption), source of medicine, source of dish items, source of paper industry, source of beauty care, cosmetics and source of wine industry

Multipurpose use of mulberry is well-documented by several perhaps one of the very rare tree species, which can serve all the important requirements of mankind namely food, fodder, fiber and fuel.

**SOURCE OF FOOD:**

**Mulberry leaf:** In India, the major nutritional problems are protein energy malnutrition, vitamin A deficiency and anemia. Protein is an essential component of human tissues including body fluids.

Mulberry leaf is rich in protein, calcium, iron, phosphorus, potassium, carotene and vitamins. The amino acids found in mulberry leaves are aspartic acid, methionine, threonine, Lysine, arginine, histidine, leucine, proline, and tryptophan. The utilization of mulberry in food industry is very well-established in South Korea and China. The leaves and leaf powder are utilized for preparation of various products to supplement human diet viz., noodles, biscuits, bread, basket bread, bean curd, broth, bukumi, cake, yogurt, sauce, salad, omlet, cookie, pudding, ice creams etc.. In India, there are reports of mulberry leaf being utilized in food preparation like, curry and parothas. The fresh and healthy mulberry leaves along with tender twigs are utilized for preparation of recipes viz., leaf pakoda, vada while the processed leaf powder in the preparation of idly, dosa, parotha, chapathi and other bakery items like cakes and biscuits.

Mulberry fruits: mulberry bears delicious fruits which are popular in many countries of the world. The fruit is a typical sorosis, juicy with sweet taste. Fresh, ripe mulberry fruits contain 85-88% of water, 7.8-9.2% carbohydrate (sugars, mainly glucose and fructose), 0.4-1.5% protein, 0.4-0.5% fat(mainly fatty acids such as linoleic, stearic and oleic acids in the seeds), 1.1-1.9% of free acids(mainly malic acids), 0.9-1.4% of fiber and 0.7-0.9% minerals. Besides using directly and as juice, fruits are also use in preparation of jam, jelly, squash and wine. In India, many commercial products of mulberry fruits are marketed at Panchagani, Maharashtra. Processing of mulberry fruits for preparation of squash and wine were standardized at CSR&TI, Mysore.

Mulberry leaf powder as an ingredient in poultry feed: In poultry feed, generally animals proteins are used as protein source. Mulberry leaf is rich in Carbohydrates (24-27%), proteins (22-24%), minerals (9-11%- and fibers (12-14%) preliminary experiments conducted at CSRTI, Mysore by incorporating processed mulberry leaf powder in poultry feed indicated their suitability for the purpose.

Mulberry foliage asfodder: Mulberry is grown as trees for fodder and does not need heavy inputs. The species of M. alba, M. indica and M. multicaulis are most suitable as green fodder due to their soft, non leathery texture, and rich protein and carbohydrate contents. About 35-40%

of food supplied to silkworms remains uneaten and forms a good fodder. As such, the combination of silk and milk is a very popular activity in select districts of Karnataka, Tamil Nadu and Andhra Pradesh. The mulberry leaves also act as stimulant for lactation in the cattle. It is estimated that 1 ha of mulberry garden can sustain 3-4 milking animals there by, adding Rs.8,000-10,000 to family income.

**SOURCE OF MEDICINE:**

Health drink from mulberry leaf: mulberry leaves have been reported to posses diverse functional properties like reduction in blood glucose, blood pressure and cholesterol in addition

to recovery from arteriosclerosis, liver lipid and also to increase the defense enzyme activity. The medicinal uses of mulberry are well-documented in Ayurveda. Mulberry has the properties of Madhura rasa, Guruguna and sheeta veerya. Mulberry leaves are considered diaphoretic and emollient. A decoction of leaves is used as a gargle in inflammations of the throat.

The health drinks/green teas prepared from mulberry are popular in Japan, China, Thailand and South Korea. Mulberry leaves contain antioxidants that help body to detoxify harmful excess free radicals. Antioxidants promote heart health; help combat and guard against diseases like diabetes, blood pressure, intestinal problems and others. The pharmaceutical value of mulberry is well-documented.

A health drink SPOORTHI had been developed at the CSR&TI, Mysore. It is a processed powder prepared from quality mulberry leaves. The product clinically tested for a period of 6 months involving 180 patients, was found effective in controlling diabetes and hypotension reducing gastric and constipation problems and revitalizing the body as an energy source.

Mulberry green tea:

In Japan, tea prepared from the powder of mulberry leaves is taken as a traditional health drink. The mulberry leaf derived tea, kuwacha (R) has already been commercialized by Saitama, Japan. The biological function of tea have been analyzed, and found to contain a wide range of biogenic amines viz., dopamine (DA), L-PODA, etc. presence of L-DOPA in mulberry leaf may act as a precursor to synthesize caffeic acid in mammals. These caffeic acid and B-hydroxyanthranilic acid can be extracted in larger quantity.

Other advantages:

- Helps to decrease quantity of cholesterol of blood vessel
- Balances blood pressure
- Relieves muscle exhaustion and cramps.
- Decreases the risk and danger of liver cancer
- Decreases wedge-shaped blood that causes clogging of blood vessel and heart muscle
- Decreases glucose from blood in case of diabetes
- Decreases bone decaying with high calcium
- Increases blood vessel and liquid in body flow smoothly to effect lungs, stomach, intestine, kidney and bladder to work continuously and effectively

Medicines from mulberry fruits: In the modern Chinese Materia Medica, mulberry fruit is classified as a blood tonic. Traditionally, mulberry fruit has been used as a medicinal agent to nourish the blood, benefit the kidneys, and treat weakness, fatigue, anaemia and premature

graying of hair. It is also used to treat urinary incontinence, tinnitus, dizziness, and constipation in the elderly and the anemic. The fruit has cooling effect and used as laxative for sore throats, dyspepsia and melancholia fruit juice has been commercially produced as a health beverage.

Medicines from mulberry root/shoot: the mulberry root is reported to posses anthelminthic and astringent properties. The roots of black mulberry, morus nigra have a special effect on the pancreas and glycogenolysis. Hence, root juice is administered to diabetic patients as decoction, which has capacity to reduce blood sugar. Mulberry root juice has the capacity of agglutinating the blood. The medicine prepared from the root of M. alba is called glucosidae which can be administered to the patients suffering from high blood pressure. The methanolic extract of roots has anti-inflammatory, exudative, proliferative and antipyretic activities. The bark of the root has a bitter taste and is somewhat acrid, possessing cathartic and anthelmintic properties. Its juice

helps in killing round worms, tape worms and hook worms in the digestive system. Several decoctions prepared from root bark are used against acute nephritis, bronchial asthma, pneumonia, cirrhosis, acne vulgaris, pertusis, whooping cough, senile pneumonia and hemoptysis. The root bark of M. nigra contains deoxyjirimycin (DNJ) alkaloid, which is said to be effective against AIDS virus.

Mulberry shoot on injury produces free flowing latex, which has the property of healing wounds and injuries. It can be used as dermal ointment.The mulberry bark can be collected by peeling the branches/shoots. The mulberry tree bark is yellowish brown and thin in appearance. The mulberry stem/shoot bark is used as purgative and vermifuge. Its main functions are to reduce heat from the lungs, promote urination and reduce oedema. In Chinese Medicine, mulberry bark is reported to treat a variety of disorders, such as cough, asthma, excessive phlegm and dysuria.

**SOURCE OF COSMETICS:**

Cosmetics from mulberry leaf: it has been reported that steam distillates of mulberry leaves contain various volatile constituents viz., n-butanol, â-ã-hexenol, methyl –ethyl acetaldehyde, n-butylaldehyde, isobutylaldehyde, valeraldehyde, hexaldehyde, â-ã-hexenal, acetone, methyl-ethyl ketone, methyl-hexyl ketone, propionic and isobutyric acids. Further, the presence of various chemical constituents such as calcium malate, succinic and tartaric acids, xanthophylls, and isoquercitrin, tannins, adenine, choline and trigonelline bases in young leaves of mulberry is reported. Various soaps, sunscreen lotions, hair oils, hair conditioners and anti-ageing creams prepared from mulberry leaves are already commercialized in Asian countries and Australia.

**TABLE : IMPORTANT COMPOUNDS OF MULBERRY LEAF POWDER USEFUL IN FORMULATION OF COMETICS**

| Activity | Attributed compounds |
|---|---|
| Cosmetic Activity | Behenic-acid, myristic-acid, Stearic-acid |
| Sunscreen Activity | Apigenin, Opcs, Rutin |
| Anti aging Activity | Apigenin,Ascorbic-acid, Beta-carotene, Bilobalide, Chromium, Quercetin. |

Beauty soap: In the market, soaps are available under the trade names of Bio-Sericin cosmetic soap and Sova Silk road cosmetic soap.

Mulberry leaf soap: This product eliminates heavy metals, cleans and freshens blood and is also good for preventing aging problems of skin. It is a highly moisturizing beauty soap, which is made of natural resources so that it can give massage effect with rich bubbles.

**SOURCE OF VALUABLE TIMBER AND FUEL:**

Timber is obtained from species of M. alba, M. indica, M. serrata and M. laevigata. The timber is comparable with that of teak. It is heavy, moderately strong, straight grained and easy to work, turn, bend and finish. Use of mulberry wood in manufacture of sports goods and toys is well known since long. Due to elasticity, strength of the wood, fine and grains and polishing, wood is used for manufacturing tennis rackets, cricket stumps, bats etc.. Because of the fine grains and smoothness, it is also extensively used in the manufacture of bobbins, pullies, tool handles furniture items, toys, agriculture implements, cheap guns, rifles, boat buildings etc.. The poles of M. laevigata (Bola) and M. serrata are very popular for house building in Andaman and Nicobar Islands. In Kumaun region, mulberry bark is used in the paper industry. The wood is also used for preparation of baskets in Uttar Pradesh and Jammu & Kashmir.

Because of huge biomass producing capacity, mulberry can be used as fuel for domestic uses. In intensive sericulture areas of Karnataka, Andhra Pradesh and Tamil Nadu, mulberry stumps/shoots are used as fuel for cooking. About 15-20tonnes of fresh shoots/stumps are produced from 1 ha of mulberry garden and 8-10tonnes of dried fuel is available 3 to 4 times a year.

Wonder plant on earth for its medicinal and pharmaceutical values, thereby making moriculture a profitable enterprise.

**SOURCE OF MULBERRY BASKET MAKING:**

The twigs and branches of mulberry plants, once the leaves are used for silkworm rearing, are generally used for preparing manure or for fuel in the rural areas. But, in some parts of the country, they are used in the preparation of baskets for agricultural purposes, which bring in better value addition to farmers.

For example, the farmers in sujanpur, pathankot, dharblock, haridwar and other areas in the region use mulberry twigs for making basket and handle of the agricultural implements.

The farmers here take up this work mainly as a part time venture when agricultural activities are less or after the crop harvest; but for many, it's a source of livelihood too. the whole family is engaged in the work of pruning, collection, maintenance of the mulberry twigs for basket making.

**SOURCE OF MULBERRY WOOD ART:**

The uprooted old mulberry stumps are excellent firewood. Mulberry wood is used for making sports items like cricket bats. May be, no one ever thought that mulberry wood and old stumps can also be materials for art.

The repeated pruning of mulberry plants and trees makes the branches take curious turns and curves. White ants which inhabit such old wood eat away a lot of sift parts, leaving the hard wood an artistic look, naturally. With a little artistic aptitude and approach, and a lot of patience, one can convert these dried and curiously shaped wood pieces into fine art materials of various shapes. Finely finished products will enjoy better value addition and market prospects. Wood paint or varnish painted product will give an exquisite look.

**SOURCE OF DISH ITEMS:**

Mulberry leaves are used for human consumption in the form of mulberry leaf tea or juice, and also to prepare other delicious recipes. In the present study, mulberry based tomato and onion soup were prepared.

Three varieties of mulberry viz., L-1, CM, and S-1531 were randomly selected. The leaves at second, third and fourth position from the apex of the plant were plucked.

| Nutrient | Mulberry leaves | Spinach | Fenugreek leaves | Amarnath | Bathua leaves | Mustard leaves |
|---|---|---|---|---|---|---|
| Protein (g) | 6.78 | 2.0 | 4.4 | 4.0 | 3.7 | 4.0 |
| Carotene(micro g) | 13125 | 5580 | 2340 | 5520 | 1740 | 2622 |
| Iron(mg) | 7.84 | 1.14 | 1.93 | 3.49 | 4.20 | 16.30 |
| Calcium(mg) | 786 | 73 | 395 | 397 | 150 | 155 |
| Vitamin C(mg) | 230 | 28 | 52 | 99 | 35 | 33 |
| Fiber(g) | 1.85 | 0.6 | 1.1 | 1.0 | 0.8 | 0.8 |

**TABLE 2: STANDARDIZED RECIPE FOR MULBERRY LEAF BASED TOMATO AND ONION SOUPS**

| Ingredients | Mulberry leaf based tomato soup (g) | Mulberry leaf based onion soup (g) |
|---|---|---|
| Mulberry leaves | 60 | 60 |
| Tomato | 40 | 40 |
| Ginger | 10 | 10 |
| Butter | 5 | 5 |
| Corn flour | 10 | 10 |
| Black pepper | 0.5 | 1 |
| Salt | 3 | 2.5 |
| Cumin seeds | 0.5 | 0.5 |
| Lemon juice | Few drops | |

**TABLE3: NUTRIENT COMPOSITION OF FORMULATED SOUPS**

| Variety | Moisture percent | Crude protein (g/100g) | Iron(mg/100g) | Ascorbic acid(mg/100g) |
|---|---|---|---|---|
| Mulberry leaf based tomato soup(CM) | 89.31 | 5.39 | 2.110 | 12.00 |
| Tomato soup-control | 88.85 | 0.87 | 2.142 | 4.00 |
| Mulberry leaf based onion soup(CM) | 89.80 | 5.83 | 2.147 | 11.33 |
| Onion soup-control | 91.15 | 1.02 | 2.070 | 2.60 |

In South Korea, to control diabetes, silkworm tables are also used. Mulberry leaves wafers are used as optimum nutrition for human health with high contents of vitamins A and C. value added byproducts of sericulture are used in large quantity of food, confectionery and chocolate industries.

With abundant medicinal properties, no wonder, mulberry finds a unique position in herbal remedies, and is used extensively in Ayurvedic for curing many serious diseases.

Area under mulberry cultivation in different states of India:

- Andhra Pradesh -38,084
- Assam- 2,813
- Jammu Kashmir -4,717
- Karnataka -1,66,000
- Kerala -1,114
- Madhya Pradesh -2,043
- Manipur -25,975
- Tamil Nadu -9,497

- Uttar Pradesh -5,665
- West Bengal -21,358
- Other -4,934 -2,82,244 hectors

Source -R.K. Datta

A vision for increasing mulberry plant parts for additional revenue generation.:

Emphasis has been made to bring out a vision for increasing of the medicinal production

- Inculcate the formers the making of the medicinal production of mulberry for additional income
- Suitable marketing facilities to be created
- Stress may be given to strengthen the extension support
- Technology development of formulation of strategies
- Area expansion programme to be taken up
- Provide suitable platform to utilize excess/waste mulberry plant parts for additional revenue generation.
- Preparation of high value antioxidant products, based on identified mulberry clone(s) for nutraceutical food industry (achievable in a time frame of 3-5 years).
- Isolation of specific products for pharmaceutical use (achievable in a time frame of 5-8 years)
- Deployment of identified major antioxidants trait(s) in breeding program for quality improvement with higher antioxidative properties (>8 years).

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# ROLE OF BIOTECHNOLOGY IN PROPAGATION OF SOME IMPORTANT MEDICINAL PLANTS

**CH. A. RAMULU**

Regional Institute of Education

Unit IX, Sachiwalaya Marg, Bhubaneswar-751022

*e-mail: charamulu@rediffmail.com*

## INTRODUCTION

The production of secondary metabolites as plant products using cell tissue culture technology is increasing demand for inclination towards preparation of herbal drugs. There is a lot of demand for raw material which contains active principles of medicinal activity available for optimum quantities in the plant body. Using in vitro multiplication or clonally propagation techniques medicinal plants can be is propagated for its diversity and conservation. According to WHO recent report, 80% of rural people still depend on herbal medicines for their common diseases and health related problems [18]. Biotechnological tools are important for in vitro multiplication of medicinal plants using various, experimental techniques such as regeneration, clonally multiplication, somatic embryos and cell line selection.

Plant tissue culture as an important aspect of Biotechnology assumes special significance for us to reap the benefit of our biodiversity and heritage. Plant Propagation is the first phase of complete package of production technology of herbal medicines that passes through cultivation, post harvest drying, herb storage, primary processing, dry extraction and quality control. Ultimate efficacy of herbal drugs mainly depends on its starting materials i.e. characterized germ plasma having desired marker (bioactive) compounds. Therefore, out sourcing of right propagates for further large scale multiplication is essential step. Plants were used from ancient times for cure of human ailments in one way or other. The advent of Ayurveda is equated with the advent of mankind on earth. The system percolated through Dhanwanthari, Aswini kumars and the great sages like Charaka and Susurtha, the Acharyas and down to present physicians. Much change has occurred in the drug manufacturing scene as well. The traditional practice of Vydyas selecting the raw drugs from his own back yard gave way to over the counter of raw drugs from its natural habitats, substantial adulteration and substitution. Plant tissue culture

strategy is being adopted to meet the increasing demand of uniform plant based medicinal products based on the principles of in vitro cloning.

The herbal medicines have been recognized as an important source of therapeutically effective medicines with the observation that of the introduction of many naturally derived products are approved as drugs. Herbal products derived from botanical sources are mostly available from wild sources and present the greatest challenges for ensuring consistent product quality. Environmental factors like condition of soil, availability of light and water, variant temperature, nutrients and geographical location effect the accumulation or percentatage of phytochemicals or phytoconstituents influence the physical appearance of the plant and chemical quality of botanical source materials( mukharjee etal).The intervention of biotechnology or to be precise, plant tissue culture for accelerating clonal multiplication of desired clones and strains of medicinal plants through micropropagation and their conservation of herbal preparation.

The pattern of diversity for morphological and alkaloid yield related traits in *Catharanthus roseus* accessions in and around were used for *in vitro* propagation. The M.S. medium containing 1.0 mg/L Benzyl amino urine, propagated with single nodal explant with induction of buds in cultures. Hardening of rooted to the soil was successful with 98% successful. Hypocotyls explants of germinating seeds were induced somatic embryos for proliferation, maturation used as propagule for multiplication. This paper reviews certain aspects of micro propagation of commonly used medicinal plant using tissue culture methods.

**Regeneration and beginning of micro propagation of Medicinal plants**

For production of plant based medicines tissue culture propagation holds tremendous potential for high quality plant material in terms of herbal products. This can only be achieved through different methods including micro propagation or clonal multiplication with this multiplication rate is greatly increased. High efficiency in regeneration from shoot apical meristems will also permit permits the production of pathogen free material. Beyond the discovery of Kinetin, the major work on *invitro* regeneration has been careered around tobacco (*Nicotiana tabacum* L.) tissue culture, culminating in the first convincing demonstration of the control of differentiation of shoots or roots or both by the kinetin-auxin ratio fallowed by carrot (*Daucus carota L.*) tissue culture and birth of concept of totipotency of plant cell with the regeneration of complete flowering plants of carrot from phloem cells. Thus the micropropagation of medicinal plants remained neglected till complete of *Rauvolfia serpentine* (L.) Benth a miracle drug plant of India, were produced from its somatic callus tissue, which grow ex vitro and fruited normally [16]. Presently, there are several reports on important medicinal plants, where the complete plants have been regenerated *in vitro* leave alone their multiplication in substantial numbers or on a large-scale and their field cultivation.

## MATERIALS AND METHODS

Micro propagation of selected medicinal plants was studied using various explants for tissue culture and clonal propagation studies both in laboratory and field conditions. Explants were prepared using surface sterilization agents like 0.1 of $Hgcl_2$ with pretreatment of 70% of Ethyl alcohol for about 5-6 minutes. The excised explants were thoroughly washed using sterile water for several rinses under laminar air flow hood. For tissue culture experiments of proliferation and induction of multiple shoots universal M.S nutrient solidified agar medium is used for all experimental investigations including induction of static cultures, in vitro shoot induction, and multiplication and propagation techniques. Various combinations of auxins and cytokinins were incorporated in the M.S medium to standerdise the protocol for exploring the genotypic specificity of the medicinal plants in response to the tissue culture. Among various growth regulators used with deferent combinations of Benzyl adenine, Napthalene acetic acid, Benzyl aminopurine and kinetin. The experimental investigations were also conducted. Plant regeneration from shoot in relation to growth of unorganized callus cultures, regeneration through somatic embryogenesis [11].

*Organogenesis*: Under control of conditions the induction of callus growth and subsequent differentiation and organogenesis is accomplished by the differential application of growth regulators in the culture medium. In M.S medium the stimulus for explants to endogenous growth regulators for induction of cell division, cell growth and tissue differentiation was observed.

Induction and Regeneration of Somatic Embryos: On appropriate suitable tissue culture medium the somatic embryogenesis can be induced by a process where groups of somatic cells/ tissues lead to the formation of somatic embryos which resemble the zygotic embryos of intact seeds. Tissue culture based Plant regeneration via somatic embryogenesis from single cells that can also be induced to produce an embryo and then on maturation of somatic embryo gives complete plants was successfully demonstrated in many medicinal plant species. Embryogenic calluses and germination of somatic embryos in vine varieties of *Medicago sativa* has been achieved using an M.S.medium containing 2, 4-Dichlorophenoxy acetic acid (2, 4-D and TDZ) as plant growth regulating substances [15].Prerequisites for commercial plantlet production for efficient development and germination through process of desiccation of somatic embryos are done by lowering of growth regulator concentrations in culture media has improved embryo-development and germination.

Successfully the somatic embryos germinated after being treated with distilled water for a week they were subsequently transferred to half-strength MS medium supplemented with 1.0 mg/L IAA, 1.0 mg/L GAB and 1% sucrose. Germination of somatic embryos is achievable on MS medium without incorporation of plant growth regulators.

**Cryopreservation:**In long term conservation methods cryopreservation of *in vitro* cultures of medicinal plants is one of the most useful technique. In this technique of Cryopreservation leads to long term preservation method in liquid nitrogen ($-196^0$C) where the cell division, metabolic

and bio-chemical processes. A large number of tissues cultured survived plant materials can be stored in liquid nitrogen. Cryopreservation provides an opportunity for conservation of endangered medicinal plants since whole plants can regenerate from frozen culture[5]. The cell cultures of medicinal and alkaloid producing plants of *Rauvolfia serpentine*, *D. lantana, A. belladonna, Hyoscyamus sps*. Low temperature storage has been successfully reported for production of secondary plant products. The Plant materials which is stored under cryopreservation techniques while regeneration of plants and acclimatization there is no abnormality is seen either in fertility or in alkaloid content, Cryopreservation has been used successfully to store a range of tissue types, including meristems, anthers/ pollen, embryos, calli and even protoplasts [7].

**REPRODUCTVE PROPAGULES FOR PLANT PROPAGATION:**

To preserves the essential genetic characteristics of medicinal flora Plant propagation multiplies plants in bulk quantity through their vegetative propagules and other related material. Seed is the essential best and source of multiplication of most of the plant species. Due to environmental and physiological factors variations in germination are observed some are germinate easily and some are very difficult to germinate under normal conditions. Seeds of some plant species germinate very uniformly and some are very recalcitrant in germination. Vegetative methods may employ use of different plant parts such as root, crown, rhizome, runner, stolon, sucker, tuber, stem cutting. It may include different methods of propagation like layering, grafting and budding [6].

*Ocimum sanctum* L. Family: Lamiaceae.This is well-known sacred plant of the Indians. It is much branched erect herb, up to 75 cm high, hairy all over. Leaves opposite, about 5 cms long, margins entire or toothed: hairy on upper as well as lower surface, dotted with minute glands, aromatic. Flowers are small, purplish or reddish, in small compact clusters on slender spikes[4]. Fruits are small; seeds yellowish or reddish. The leaves and seeds of the plant are medicinal. The oil obtained from leaves has the property of destroying bacteria and insects.The juice of infusion of leaves is useful in bronchitis, catarrh, digestive complaints. In many Ocimum sps the seed is the main propagule of studied in diverse perfume and cosmetic industries as well as in indigenous system of medicines. After broad casting the seed material in the prepared nursery beds first and then transplanted in the field for propagation[1]. The seedlings (6-10 cm tall) are transplanted in the field at 40-60cm spacing in multiple rows which requires at the seed rate is 125g/ha.

*Bacopa monnieri (L.)Family;Scrophulariaceae* This herb spreads on ground and its stems and small leaves are succulent and fleshy. For revitalization of sense organs and improvement of intelligence and memory Brahmi is used as an important drug in Indian traditional systems of medicine. The *Baccopa monnieri* plant is propagated through vegetative stem cuttings by runners

of 10 cm long or seeds. These cuttings were planted in the soil at appropriating spacing of 20 cm. This medicinal crop is water loving and requires the sufficient soil moistrure content throughout for proliferation and good growth. The drug Brahmi consists of the whole plant [3]. The plant contains an alkaloid Bramhine, which is a cardiac tonic, provides strength and tone to the heart.

*Rauvolfia serpentine* ex Kurz Family. Apocynaceae. Sarpagandha can be propagated vegetatively by root cuttings, stem cuttings or root stems and by seeds. The plant is propagated through the raising commercial plantation nurseries. The required seed rate is 5-6kg/ ha. To get efficient germination seed material needs to be scarify and dipped in cone $H_2SO_4$ solution or hot water treatment. It is desirable to use fresh seeds and to soak in 10% NaCl solution and collect only sinking seeds. Two months old seedlings are planted at 45-60 X3 0cm in July-August. Stem cuttings of 12-20cm also can be planted. It is an erect, evergreen perennial under shrub whose medicinal uses has been known since long years. Its dried root is the medicinally important part, which contains several alkaloids. The drugs derived from root is sedative and is used to control high blood pressure and certain forms of insanity.

*Gymnema sylvestre R.Br.*Ex Schult-Asclepiadaceae.The plant is a large woody, much branched climber with pubescent young parts. It is useful in inflammations, dyspepsia, constipation, jaundice etc. The fresh leaves when chewed have the remarkable property of paralyzing the sense of taste for sweet and bitter substances for some time. The plant can be propagated through seeds and stem cuttings. Seeds are germinated in *poly bags and 3-4 months old seedlings can be planted. Tender stem can also be rooted. Older cuttings may be dipped in IAA 500 ppm and planted.* The plants are trailed on to poles or other supports.Leaves used in diabetes, chewed to reduce glycosuria has a purg action. Leaf material stimulates insuling secretion. Leaf extracts by ethyl acetate or by chloroform posses the property of destroying the sense of taste for s wet substance temporarily [8].

Asoka *Saraca Asoka (Roxb.)Family Caesalpinaceae*: It is a small tree, leaves compound, evergreen forming a dense crown; leaflets 7-25 cms slightly leathery. Flowers bright orange colored due to colored bracts in small dense branches. The plant is propagated through seeds. After soaking the seeds in water for about 12 hrs they are sown directly in seed beds. The seeds germinate within 20 days. Then the seedlings are transplanted in poly bags. Two months old seedlings are planted in the field at a spacing of 3fm.

*Marmelos(L.)Family: Rutaceae*:Bel is a medium sized deciduous tree bearing strong axillary thorns. Leaves with 3-5 leaflets. It is considered as a sacred tree. Every part of the tree is medicinally useful. Flowers greensish-white, sweet-scented, about 2.5 cm across, in small bunches. Fruit 8-20 cm diameter, globose, green, finally grayish; rind woody, pulp-orange colored, sweet, aromatice.The roots are an ingredient of 'Dasamoola'. The plant is propagated mainly through seeds. The seeds are extracted from ripe fruits and dried in sun. It is soaked in water for 24hrs and sown in seedbeds. The seeds can be germinated within 15-20 days with good

moisture content [2]. One month old grown old seedlings are to be transplanted to polybags. After 2-3 months the seedlings grown in polypots are planted in the main field at about spacing 6-8m.Neem tree *Azadirachta indica A.Juss Family: Meliaceae* Nim is a very well-known tree of India.The tree has pinnate leaves, it's divided into numerous smaller segments called leaflets, each leaflet looking like an ordinary leaf. Flowers small, white, in short axillary bunches. Fruits 1.2-1.8 cm long, green or yellow, seed one in each fruit. Neem is a medium to large sized tree, 15-20m in height. It is a highly exploited medicinal plant of Indian origin. Every part of the tree has been used for medicinal purposes. It is valuable as an antiseptic and used in the treatment of small pox. The Drug consists of dried stem bark, leaves, and root bark. The bark is a bitter tonic, astringent and antipyretic useful in skin diseases and boils a decoction of leaves is also taken internally. The nim plant is seed propagated, soak the seeds in water for 6hrs and sow directly in seedbeds at a spacing of 15X15cm. The seedlings grown 60-90 days in poly pots can be used for planting material in the main field and venue plantations programmes.

*Phyllanthus emblica (L.)Family; Euphorbiaceae.*It is a small to meddle sized deciduous tree, Leaves small 10-13 mm long 2-3mm broad very closely set in pinnate fashion, branch let's look rather feathery in general appearance. Male and female flower borne on same tree, flowers pale green, usually small dense clusters below the leaves. Green or yellowish: seeds 6. Fruit1.5-2.5 cm diameter, fleshy, roundish, rather indistinctly marked into 6lobes, pale green or yellowish; Emblica fruits are a good liver tonic: raw fruits are cooling and mild laxative. Fermented liquor made from the fruits is considered useful in indigestion, anaemia, jaundice, and certain heart complaints. It is very rich source of vitamin C .The fruit is useful in hemorrhage, leucoderma and dysentery. The plant is usually propagated through seeds. Soft wood grafting is now extensively practiced. Mature seeds extracted from its hard seed coat are soaked in water for 3-4 hrs and sown directly in seedbeds. After one month, the seedlings are transplanted in polybags. One year old seedlings are planted in the main field at a spacing of 8.5x8.5 m.

**RESULTS AND DISSCUSSION:**

In the case *Rauvolfia serpentine* (l.) Benth seeds have poor viability and poor germination percentage, while propagation by root cuttingsis also a limiting factor, making micro propagation as essential proposition in order to meet the demand for quite a huge amount of raw material by pharmaceutical industry. Tissue culture plants have been regenerated from somatic proliferating tissue, where morphogenic patterns of differentiation comprised somatic embryogenesis, regeneration of shoot buds from toots differentiated somatic tissue. In another approach of propagation, a much faster rate of multiplication of clonal plants has been obtained through shoot-to-shoot proliferation employing nodal stem segments[13].Micropropagation insures a good regular supply of medicinal plants, using minimum space and time [10]. There are several advantages of in vitro micro propagation of medicinal plants for High rate of Multipliction,plant material will be available all year round, identification and production of clones with desired

characteristics, production of secondary plant products, conservation, cryopreservation and improved genetically engineered plant species possibly be produced [9].

## CONCLUSIONS:

Although there are number or reports and reviews published on micro propagation of medicinal plants, they do not provide information related to factual status of the field where reports on differentiation of shoots, embryos from callus or regeneration of shoot tips have been included. In fact, most of pharmaceutically important medicinal plants have not been micro propagated. In the present study micro propagation of seven important medicinal plants investigated with regard to callus, morphogenesis, somatic embryogenesis, multiplication and clonal propagation under field conditions.

Plants have been an important source of medicine for thousands of years. Medicines in common use, such as aspirin and digitalis, are derived from plants and new transgenic varieties could be created as efficient green production lines fro other pharmaceuticals as well as vaccines and anticancer drugs [14]. Tissue culture is useful for multiplying and conserving the species, which are difficult to regenerate conventional methods and save them from extinction. Genetic transformation may provide increased and efficient system for *in vitro* production of secondary metabolites. The improved *in vitro* plant cell culture systems have potential for commercial exploitation of secondary metabolites[12]. Tissue culture protocols have been developed for several plants but there are many other species, which are over exploited in pharmaceutical industries and need conservation. Using micro propagation technology, medicinally important plants where there is a need to synthesize secondary metabolites possibly propagated in large scale for planting elite and endangered sps.Advances in plant tissue culture will enable rapid multiplication and sustainable use of medicinal plants for future genernarations [17].

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# GUMS & RESINS USED IN AYURVEDA.

**Vaidya Pammi Satyanarayana Sastry**
**Founder & Managing Trustee, Dr.Achanta Lakshmipathi Ayurveda Libray Trust**
**Geeta Apartments, New Ayodhyanagar,**
**VIJAYAWADA- 520003**

Ayurveda categorized all the herbal plants according to their parts of plants having maximum therapeutic value. viz. having medicinal value in roots, barks, heartwoods, leaves, seeds, flowers, Gums etc Hence, gums are identified as having medicinal value in Vedic period itself.

Gums are named as Niryasa i.e. that which comes out of the tree, the exudation Be it a Gum or a resin as per the modern terminology. Hence, the Gums in Ayurveda can be Gums or resins or oleo resins. These gums are used either as single drugs or along with other drugs. Few of those Gums with their medicinal usages are given under. These are only representative, but not exhaustive.

1. Bombax ceiba Linn.

This is called Erra burugu in Telugu and *Salmali* in Sanscrit. All the parts of this tree, root, stem bark, leaves, flowers, fruit, gum, thorns too have medicinal value. Gum is abundantly used in Ayurveda. It is astringent, cooling, stimulant, aphrodisiac, tonic, styptic and demulcent. Useful in dysentery, haemoptysis of pulmonary tuberculosis, influenza, menorrhagia, burning sensation, stangury, haemorrhoids, blood impurities, and vitiated conditions of *Pitta dosha*

- The Gum powder is a very popular product of all Pharmacies of Ayurveda. This cures gynic troubles of ladies.
- The gum powder is mixed with honey and administered to cure dysentery.
- Make a hole of sufficient size in the trunk of this tree and insert Dried fruits of Terminalia chebula and seal the hole. Collect the fruits after a month. These fruits are

powdered and taken every day morning. Dose is powder of one fruit. If continued, the symptoms of old age are delayed.

- The thorn is ground on whet stone with little water and the paste is applied on the face to get rid of the black patches.
- Make cuts on the roots of the tree and collect the exudation and dry. Powder it and keep. Take alone or with the powder of the Gingely seeds along with honey, cow's ghee and cow's milk daily. This is a very good asphrodisiac.

2. Styrax benzoin officinalis.

This is called Sambrani in Telugu and is known since centuries as good grankincense. This is used for fumigation as an antibacterial and anti viral.

- Wounds are fumigated with this gum to ward off bacterial infection and early healing.
- Sambrani, Rice & Black pepper are ground to paste and cooked. This paste is applied on the forehead and temples to get rid of effects of Cold and headaches.
- The gum powder is administered with Cow's Milk to cure consumption (TB), Urinary disorders, Wounds, Bacterial infections, Dysentery and Anemia.
- The powder is stuffed in dry Date Fruit, tied with a thread, cooked in Cow's milk till it becomes tender, dry to make it moisture free> This is kept soaked in honey. One fruit is administered every day twice, morning and evening to get rid of Diabetis insipidus and Dabetic mellitus.
- About 15 gms. Of the gum powder is mixed with curds and administered to ally dysentery.
- The oil of the gum or gum powder processed with Gingely oil is applied in skin affections and eruptions.
- The gum powder with camphor when ground becomes thick plaster. This is used as plaster to cure lumps due to STDs.(Sexually transmitted diseases).
- 200 mg. of the gum powder is administered in bronchitis and coughs.

3. Commiphora wightii (Arn.)Bhand.

This is called Mahisakshi Guggulu in Telugu. Drug of choice for all vata disorders. There are more than160 formulations for different ailments of Vata. Maha Yoga Raja Guggulu, a very popular medicine is a household name. But, the pity is that, this plant grows in a particular small area in Asia only. The yield of Gum is not sufficient for the Ayurvedic pharmaceutical industry

in the country. With the result,adulterated with gum of Boswellia serrata and other gum ykielding plants. The other species of Commiphora which yield Guggulu are 0 C.Roxburghii(Arn.)Enl. & C. opobalsamum(Linn.)Engl.

Guggulu is a drug of choice for many ailments viz. all types of Vata Vyadhis, blood related ailments, wounds, heart ailments, anemia, liver disorders, vaginal disorders, digestive disorders etc. etc. These are very few to mention. Apart from successful usage since centuries, trials done proved that the guggulu preparation with dry ginger is very efficacious in Rheumatioid arthritis, obesity, and hyperchlesteraemia.

The plant is also becoming exinct. Efforts are to be made to save and coultivate in abundance. This plant is found in Bellary and Mysore. But, it is said, do not yield gum due to climatic conditions.

4. Commiphora myrrha (Nees) Engl.

This gum is called Hirabol in Hindi & Balintabolu in Telugu. This is very much sought after in cases of Gynaecological ailments.

- The gum powder is ground with Lemon juice and applied on pains due to beatings and blows.
- Diluted in alchohol and applied on fouling wounds for immediate relief.
- When administered internally, gives immediate heat to the body and the pulse rate increases.

5. Boswellia serrata Roxb. Ex. Colebr.

This is called Sala guggulu or Sallaki or Gandha feroja. Excludes as colourless semi fluid and solidifies as whitish to golden yellow. Sometimes it is reddish brown, greenish yellow or dull yellow to orange in colour.

- The Oleo-resin is a very good substitute for Gum of Commiphora weitii and an adulterant too. It is called Sallaki or Salai guggulu.
- The gum is anti arthritic, anti inflammatory, bitter astringent, anti pyretic, expectorant and is indicated in many more ailments like of commiphora weitii guggulu.

6. Butea monosperma (Lam.)Kuntze.

The gum of Butea monosperma is called gum kino or Bengal kino. This has many uses in Ayurveda like Mahisakshi guggulu and Sambrani. It is astringent, constipating, haemostatic, apshrodisiac, depurative and tonic. Useful in diarrhea, lhaemorrhoids, haemoptysis,

haematemesis, ldiabetes, leprosy, skin diseases, ulcer, debility, hyperacidity, dyspepsia and fever.

- This gum is given orally after delivery as Tonic
- 10-20 gms. Of gum is given for once week from the first day of menstruation. This checks pregnancy for one year.
- Gum is given orally for relieving pain in delivery and in lumbago.
- One gram of this gum and one gram of root powder of Bombax ceiba mixed with sugar is administered orally once daily for 5 days in kidney stones.

7. Cochlospermum gossypium DC.

This is called Katira gond. Or Gum karaya or Gum Tragacantha.

The gum is thrmogenic and hence consumed in summer. Sedative. Useful in cough, diarrhea, dysentery< and Pharangitis.

8. Acasia nilotic (Linn.)

This is called Tumm jiguru in Telugu.

- Six grams of babool gum and six grams of Cumin seeds are well soaked in 100 ml. of water over night and boiled in the morning, sand Strained. This decoction is administered in jaundice.
- Gum is kept in the mouth in asthma and juice is swallowed.
- Gum is fried in ghee is useful as nutritive tonic and apshrodisiac.
- The gum is administered in the form lof mucilage in diarrhea and dysentery and also in diabeties mellitus.
- The powedered gum with quinine is given in fevers complicated with diarrhea anddysentery.
- The powdered gum arrests haemorrhages.
- The gum is mixed with white of the egg is applied in burns and scalds (Blisters).

  Acacia powder, also known as Gum Arabic is a soluble dietary fiber that is made from the gum of the Acacia tree, which grows in tropical and sub tropical climates. Used in ancient Egypt as part of the mummification process. The cultivation and harvesting of acaci powder hasnot changed very much in thousands of years. In modern times, it is primarily used in the treatment of irritable bowel syndrome (IBS)

9. Azadircta indica A.juss.

This is called Vepa jiguru in Telugu.

- The decoction of powder of dried gooseberry fruits and this gum mixed with the Bhasma of Karpoora Shilajit in doses of 200 mg. is given in albuminuria.
- The gum is applied on the affected part in dental pain.
- The gum is very useful in bloody dysentery and diabetes insipidus.
- The gum is a one of the ingredients of Yogeswara Prabhavati guti etc.

10. Mangifera indica Linn.

- This mamidi jiguru is ground with castor oil and applied on the cracks of the foot/palms and wamed with charcoal fire.
- The gum is ground well with lemon juice or gingely oil and applied on the skin ailments like irritation, boils etc.

11. Moringa oleifera Lamk.

- This is called munaga jiguru in Telugu. Is ground with oil or hkeated is applied on blows, pains, paralysis, woulds etc. The gum is diuretic, astringent and abortifacient and is used against asthma.

  The moring tree gum is used in treating various ailments like asthma, dysentery, fevers, intestinal cancer and headaches too. Apart from medicinal purposes, the Moringa gum is also used in various other industrial applications.

12. Gardenia recinifera

This is called Karinguva in Telugu and Dikamali in Hindi etc.

- The gum and the fruits are used in fevers in Gujarat.
- The gum is fumigated to wardoff bacteria.

Conclusion.

There many more gums used in Ayurveda. They are Anogenossus acuminate.Vateria indica Linn. Cedrus deodara, . Balanites aegyptica, Aquilaria agallocha, Ferula asfoetida, Alangium salivifolium, Shorea robusta, Baringtonia acutangula, Sapindus emarginatus, Ferula galbanifluea boiss. Acacia catechu, Cassia ariculata, Cordia dichotoma, Syzygium cumini, Mimusops elengi, Calophyllum inophyllum, Ficus benghalensis, etc..

There are few more gums used in Unani medicine like Dragons blood (resin from Dracaena cinnabari, Gum Euphorbia resinifere birg, grown in Morraco, Kahruba – fossil resin of Pinus

succifera, Rumi mastagi- Pistacia lantisus, Scamonia or Sakmunia from Convulus scammonia (This is widely used as laxative.)

Tail piece;

Occassionally, a gum is found on the Coconuts. This is certainly not from the fruit inside but from the fibre. What is this ?

# Tribal Medicine in Dandakaranya

**Dr. Koppula Hemadri**

Ethno-botany is said to be the study of plants used by the aborigines (J.W. Harshberger, 1895). Ethno-medicine or Tribal-medicine is the pharmaceutical knowledge acquired by the aborigines based on Medico-Biological experiences- accidental or otherwise, and carried forward from generation to generation. It is true that today, the tribes all over India, own a mine of knowledge in herbs and herbal treatment. This knowledge, I believe, is worth several Noble Prizes! It is high time that tribal medicine is recognized by the authorities concerned, as a system of medicine, namely 'Tribal System of Medicine'.

**Why I got attracted towards Tribal Medicine?**

In 1963, when I joined Botanical Survey of India, I had no idea of medicinal herbs. My duty at BSI was to explore the Flora and the Vegetation of Western Ghats. There, I concentrated in identification of various botanicals based on International Code of Botanical Nomenclature. (You know? I discovered 24 new plant species and one new genus!). I also got interest in the therapeutics of locally available herbs. Later, in 1971, I was offered a Central Government post to head the Medico-Botanical Survey Unit created by the 'Central Council for Research in Indian Medicine & Homoeopathy', in the State of Andhra Pradesh. This position gave me ample opportunities to closely observe the Socio-Religious Customs of the Tribes of Andhra Pradesh, Chhattisgarh and parts of Orissa State bordering Andhra Pradesh, in addition to Medicinal Flora of these regions.

**Enter the Tribal Hamlet... and win the hearts!**

Tribal people are generally shy and hence, avoid meeting and talking to strangers, leave alone, sharing their feelings and experiences! All the more, they even dare not come in front of a new comer, until and unless the Head of the hamlet permits to do so! Hence, I have made it a point to approach the 'Sirpanch' or 'Pargania Mazhi' (Head of the village) first with the co-

ordination of the Forest officials of the area concerned. As a next step, I used to have a social gathering with the people and try to record the clan's Socio-Religious Customs which they followed during their entire life period, i.e., from 'Birth to Death'. This kind of enquiry helped me indirectly to collect Medico- and other Ethno-Botanical data. My first question put to the gathering normally used to be 'Would you administer any medicine to the new-born baby and the mother immediately after the delivery?' This question used to give me ample opportunity to get more and more data on medicinal plants and their uses for healthy and happy living.

For instance: In Konda Reddy tribe, as soon as the child is born, the mother is given water extract of lime tree (*Citrus aurantifolia*) bark, to protect her from puerperal diseases. No food of any kind is allowed on that day. The next 3 days, the mother is given cooked 'Jonna' (*Sorghum vulgare*: Pearl millets: Jowar) along with a powder made of 'Mirchi' (Dry chillies: *Capsicum annuum*) and salt, once a day. Thereafter, till umbilical cord is dropped, the mother is also allowed to eat cooked rice (*Oryza sativa*) together with a powdered preparation made of 'Kandi pappu' (Red gram: *Cajanus cajan*), Vellulli (Garlic: *Allium sativum*), and dried chillies.

In Koya tribe, on the day of delivery, the mother is given hot water bath and, internally a potion known as 'Talli Mandu' (Mother-Care Medicine) made of stem barks of 'Torri Yelaga'(*Hesperethusa crenulata*) and 'Nemali Chettu'(*Holoptelea integrifolia*). No food is given to the mother on that day. In some places, the mother is given a tumbler full of 'Mohul' liquor distilled from corollas of *Madhuca latifolia*.

In Kutiya Rana, on the day of delivery, the mother is made to bathe in cold water after smearing a paste made of 'Holdi'( turmeric: *Curcuma longa*) powder in 'Olsi'(Linseed: *Linum usitatissimum*) oil all over the body. A few drops of 'Til' (*Sesamum indicum*) oil are also put in to the ears. The child is bathed in warm water.

In Gond tribe, on the day of delivery, the mother is given one dose of decoction made of 'Kulthi' (Horse - gram: seed of *Dolichos biflorus*). To improve milk secretion, she is given one or two doses of a paste prepared out of 'Dudmangra' (*Holostemma adakodien*) leaf or root.

In case of Raj-Gonds, on the second day, the mother is fed with a sweet preparation made of 'Til' (Gingelly: *Sesamum indicum*) seed, jaggery and ghee. The next day, one dose of decoction made of soft, apical shoot of *Phoenix acaulis*, known as 'Chhind kanda', together with Kulthi beej (seed of Horse gram: *Dolichos biflorus*) and 'Rasna jadi' (Root of *Blepharispermum subsessile*) is given.

The 'Muria' mother, on the 4th day, is fed with 15-20g of a paste made of equal quantities of gingelly seed, Rasna jadi, Bhallataka beej (Nut of *Semecarpus anacardium*), Chhind kanda, Lasuna (Cloves of garlic: *Allium sativum*) and jaggery, just before normal meal.

The 'Bhatra' mother, on the 3rd day, is given internally, a potion made of 'Chhind kanda', 'Rasna jadi', 'Bhallataka jadi' (Root of *Semecarpus anacardium*), 'Sargi jadi' (root of *Shorea robusta*) and 'Patala kumda' (Tuberous root of *Pueraria tuberosa*), twice a day, in addition to normal meals.

So to say, that the data collection on the socio-religious customs of the tribes had not only thrown light on Ethno-Medicine, but also made me closer to their hearts, which helped me gather plenty of first-hand information on Tribal Medicine. Field work with the Tribal 'Vejjus' (Doctors) further enriched my knowledge in Ethno-Medico-Botany.

**The Net Result!**

I am convinced that the tribal people possess a treasure trove of Medicinal Herbs. They know how to use local herbs for a number of diseases. They have 'Chekka Mandu'- a potion prepared with barks and roots to protect the Child and Mother; 'Thalli Mandu' (Mother's Medicine) to save the mother from all ailments connected with the child-birth. They have herbs to improve appetite, increase breast-milk, kill the intestinal worms; heal injuries, broken bones and save the kids from dehydration. They have recipes to control fevers, leucorrhoea, menorrhagia, dysmenorrhoea, dysentery; tonics and aphrodisiacs for enjoying life and sex. Their crude pills and decoctions relieve body ache, joint pains; heal skin diseases, set right anaemia and dropsy; control diabetes, asthma; cure jaundice, piles, paralysis and epilepsy. Tribal doctors'

knowledge in anti-fertility, abortion and fertility-promoting herbs is note worthy. They use herbal smokes to ward-off viral-fevers and fungal infections. They are experts in using immune-modulators.

Now, I shall share a few personal experiences with Tribal Medicine:

**Abscessdisappeared**!

A Tribal Vejju (Medicine Man) claimed that one herb called 'Nelamarri', botanically known as *Elytraria acaulis*, heals abscess growth on the breast (Breast Cancer?). Surprisingly, when the herb was sent to the American Cancer Research Centre for 'screening', it is found to possess 'Anti-Carcinogenic' activity, confirming the claim of Tribal Doctor! A few years later, I have had the opportunity to test this herb, but on a different contest. A hard and round abscess appeared on my left cheek in the year 1999 and increased in size- year after year. I allowed it grow for 3 years. Then in the month of February, 2002, I tried leaf of *Elytraria* hoping thus: 'When the herb is anti-carcinogenic in action, why can't it cure a simple abscess like this?' The first day, I collected a fresh leaf, cut it into six pieces; rubbed one piece on the abscess and waited for one hour for next application. Thus, I gave six external applications per day. On the 7th day, the abscess burst open, throwing white, granular pus out, in one go! By the 9th day, the abscess healed-up completely. Even its scar disappeared!

**Acute Rheumatoid Arthritis Cured!**

When a young lady of 30 years requested me to relieve her off her suffering from acute rheumatoid arthritis, the first thing that struck to my mind was the recipes of various tribal Vejjus claimed to cure joint pains, body pains, swellings etc. So, I selected four plants, namely, 'Velturu Chettu' (*Dichrostachys cinerea*), 'Andugu Chettu' (*Boswellia serrata*), 'Atuka Maamidi' (*Boerhaavia diffusa*), 'Nalla Uppi' (*Capparis sepiaria*)- supposed to cure such conditions as the above lady suffering from, and prepared an extract, filled in 250mg capsules for internal use- 2 per day. On the 4th day, the Lady's husband phoned me saying that "Swellings all over the body vanished. Pain, however, is still lingering. Would you please

suggest the next step to be followed?" Now I thought of 'Nemali Chettu', botanically known as *Holoptelea integrifolia*. Long ago, a Koya Vejju of famous Papi Hills beside the River Godavari, once revealed a secret to me thus: "Sir, we give juice extracted from leaf of 'Nemali Chettu' after heating it on gentle fire, to subside 'labour pains' and also to protect the mother from all sorts of post-natal ailments". So, I prepared the above leaf-extract, filled it in capsules and gave the patient twice a day internally. Alas! The pains also stopped within 3 days! *Hats-off to Tribal Medicine!* The 'story' has not yet ended. After a month or so, one fine morning, the husband phoned me and requested if he can visit my house. I said 'Yes'. By 10 a.m. sharp, six people entered my room, settled in a sofa and chairs, and started chit-chatting. I asked the husband how the patient is. He pointed his finger at the lady sitting in the chair very near to me and said 'This is my wife'. Believe me! She is simply normal like any other healthy person! There is no comparison between the lady I had seen two months ago, with puffed body, swollen at every joint, unable to move even an inch, expressing unbearable pain if any part of the body is touched... and the one now sitting by my side, after climbing-up stair case covering more than 60 steps by foot, like any other normal individual!

So, what I want to convey is, how miraculous the tribal recipe worked on Acute Rheumatoid Arthritis. The recipe is simple, but the result is mind blowing!

I shall conclude my experiences with one more episode...

**Rauvolfia Root in Diabetes!**

In 1991, the then Managing Director of Girijan Co-Operative Corporation (GCC), Government of Andhra Pradesh, Mr. T. Vijay Kumar, IAS arranged a visit to Sankhavaram- a forest village, to interrogate the Tribal Medicine Men and record first hand information on the Medicinal Herbs and their therapeutic uses. The Vejjus (Doctors) gathered there showed me a variety of botanicals and revealed their medicinal uses, mode of preparation of the recipe & dose. Of the recipes thus recorded, I found the one given by Ravula Venkatrao of Dara Mallapuram – a tribal hamlet adjoining Sankhavaram village, to be quite interesting. His recipe is for Diabetes Mellitus. In general, most of the herbal medicine men use single or a combination of several

herbs such as, roots of *Aegle marmelos* (Maaredu Veru), *Gymnema sylvestre* (Podapatri Veru), *Strychnos potatorum* (Indupa Chettu Veru), seed of *Syzygium cumini* (Alam Neredu Pikka) and bark *of Acacia chundra* (Chandra Patta). However, our present Vejju insisted on adding one more herb, namely, the root of *Rauvolfia serpentina* (Pataalagarudi Veru) in addition to the ones mentioned above. I was wondering what would be the role of *Rauvolfia* in curing Diabetes. I shared this first hand information with Press Reporters, and it came as wonder news in several daily news papers the next day.

In 1994, I happened to go through a news item in Times of India (5th February, Bombay edition), with a caption "DRUG TO TREAT KIDNEY CLEARED". The report is as follows.

Washington: The U.S. Food and Drug Administration has approved a common blood pressure medicine to be used to slow the massive kidney damage common among diabetics, reports AP. Captopril is the first drug approved to treat the condition known as diabetic nephropathy, that afflicts hundreds of thousands of type 1 insulin-dependent diabetics, the FDA said on Thursday. Until now, the only treatments were dialysis or a kidney transplant. "Captopril provides another tool- along with intensive blood-sugar control- to prevent or delay complications of diabetes", Dr. Phillip Gorden of the National Institute of Diabetes and digestive and Kidney diseases said on Thursday. The drug sold under the name Capotenin, is Bristol-Myers-Squibb's best-selling product line, generating about $1.6 billion in sales. It is already used to treat high blood pressure, congestive heart failure and some types of heart attack.

After going through this news item, one would appreciate the wisdom of 'Vejju' (Medicine- man) of a remote forest hamlet, who suggested anti-blood pressure drug along with other anti-glycemic herbs for diabetics! Once again 'Hats off to Tribal Medicine!'

**Expert opinion**

Three decades ago, a group of Doctors of Modern Medicine visited interior forest-villages of West Bengal, Bihar and Orissa states, gathered first hand information on Tribal Medicine and acclaimed it to be very satisfactory. According to these researchers, 76% of cases

pertaining to viral and other fevers of unknown reason and 63% of Breathing and Gastro-enteric cases; about 45% of Joint Pain cases and 63% of Dermatitis cases are cured with Tribal herbal recipes. In case of Rheumatoid Arthritis, the result is 70% - 80%, the studies revealed. 'Alas! This is far better than the ones treated by Modern Medicine'- the team members concluded!

**Unhappy Tribal Vejjus**

The Tribal 'Doctors' are not happy with the way the researchers are robbing hereditary therapeutic knowledge in the guise of Medical Research. "Scientists of various Institutes within and outside the country visit us now and then, utilize our services in conducting field work, interact with us to collect data on our secret recipes for various disease ailments in detail and disappear there after! Has anyone cared to honour us as co-workers and offer share in patenting and other benefits thus obtained?" they aver. Yes! In principle I agree with them. However, I suggest them not to blame others for the present state of affairs. As a first step, they should convince/demand the Governments concerned to establish institutes for Tribal Medicine and Herbal Research, to conduct studies as per the W.H.O. established norms and make the System a legitimate one. No doubt that the tribes' knowledge in the therapeutics of local floras is a Gold Mine! As is evident from sporadic, preliminary studies, research on diseases such as rheumatoid arthritis, malaria and breast cancer, would reap rich dividends in the form of newer 'Patented Remedies' in a short period.

Last but not the least- medicinal plants are part and parcel of the Flora and Vegetation. At present the Forest Department has been utilizing the services of local tribes in various programmes pertaining to the protection of Biological Diversity. In this connection, I wish that the Bio-diversity Board, the Health and other Ministries concerned encourage Tribal Medicine in a big way, so that the tribes themselves and the beneficiaries of Tribal Medicine too, come forward to protect useful and rare Medicinal Plants found in and around their habitats.

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# ETHNOBOTANICAL REMEDIES OF TRIBAL PEOPLE IN THE MAHA-MUTHARAM MANDAL OF KARIMNAGAR DISTRICT OF ANDHRA PRADESH, INDIA

**E. NARASIMHA MURTHY, N. VENUMADHAV & M. ARJUN[1]**

Department of Botany, Satavahana University, Karimnagar-505 001

[1]Department of Botany, Telangana University, Dichpally0593322

E-mail: murthyen@yahoo.co.in; nalimela0@gmail.com

## ABSTRACT

Several field trips were conducted during 2011-2013 to document the botanical knowledge of the ethnic tribes inhabiting in the Maha-Muttaram mandal. Here we reported more than 20 ethno-medicinal plants from the tribal people inhabiting the mandal. They are remedies for various ailments. These ethno-medicinal plant specimens are preserved in the Satavahana University Herbarium, Karimnagar.

## INTRODUCTION:

In a developing country like India, where major portion of its population is residing in rural and tribal areas and which have their own culture specific medical heritage, the health policy makers and health care planners are not left the tribal areas and the rural areas for many health care programs even met with stiff resistance. While local people usually welcome the provision of hospitals and public health programs, the shift to using biomedicine often means that healing traditions are eroded and traditional knowledge lost in the process. This paves great flaw to their native medicine system. Before the existence of ethno-medicine from the tribal community, it is necessary to document and understand this culture-specific medical heritage. (K.S. Brumot & T.S. Naidu, 2007).Among the scheduled tribes of Andhra Pradesh, Erukalas, Gonds,Koyas and Lambada are the major communities in the Karimnagar district. Of several natural forest ecosystems in the district Ramagiri and Mahadevpur are known for their medicinal flora. Kapoor & Kapoor (1980) were the first to pay attention publish the medicinal plant wealth of Karimnagar district. Later, Hemadri (1990) reported 436medicinal plants of the district( just mere names and vernaculars) . Ravishankar (1990) studied the ethnobotany of Karimnagar

district, along with the adjacent Adilabad district. An estimation of local dependency on forest was made by Reddy V.M. (1996) and Rao et al (1998). Rao etal (1998) reported 30-33 plants used in ethno-medicine by the tribals of Mahadevapur. There are ethnobotanical studies with emphasis on ethnoveterinary medicine in the neighbouring district of Warangal (Reddy et al 1992) and Nalgonda (Reddy & Raju 2000). C.S. Reddy et al (2001) made an attempt to study the ethnoveterinary medicinal plants used by the Gonds of Karimangar district. Naqvi (2001) recorded not more than 150 ethno medicinal plants from the Karimnagar district in his Ph.D. thesis.

**STUDY AREA:**

The district lies on the northern part of Andhra Pradesh approximately between the latitudes 18 deg and 19 deg and longitudes 78 deg. 30 mn and 80 deg 31 min. The district is bounded on the north by Adilabad district, on the west by Medak District,on the North West by Nizamabad on the South by Warangal District and on the East by Godavari River. The forest in the district are grouped into two divisions viz. Karimnagar East Division and Karimnagar West Division. The east division consists of four ranges viz. Azamnagar, Bhupalapalle, Chintakani and Mahadevpur while the west forest contains five ranges viz Jagitial, Raikal, Koidmial,Manthani and Sircilla. The forest of this district fall under Tropical dry deciduous and Tropical thorn forest types consisting of mixed teak and miscellaneous type of corporation. The dominant Scheduled Tribes Communities are Koya (Dorasattam) and Gond. The Scheduled Tribe Population is concentrated in the Revenue mandals of Maha-mutharam, Mahadevpur, Malharrao, Ellareddypet,Husnabad, Kataram and Sarangapur At Mahadevpur forest range Nayakpod (Padmanayaka), Koya (Dorasattamu) are found among Local tribes with different habits, cultures and socio economic backgrounds. Of these Koyas are mainly settled cultivators, but depend largely upon the near by forests for non-timber products. Nayakapods are primarily agriculturists and shifting cultivaters. They also collect forest produce. Lambadas a gypsy non-local tribe are largely workers, at places, settled agriculturists.

**MATERIALS AND METHODS**

Ethnobotanical survey included repeated interviews with aged ethnic people, local herbal healers, shepherds, tribal headmen, owners of cattle herds, etc., in different seasons for two

consecutive years. Several field trips were conducted between the years 2004 to 2006 in the sanctuary area to record the utilization of the plant wealth used by the local tribal communities. The data were collected through questionnaires, discussions among the tribal people in their local language. The information on useful plant species, parts used, local names and mode of utilization was collected. The data collected were further verified and cross-checked in different villages with different tribal sub communities. Plants used in their daily needs were also collected. The plant specimens were pressed and deposited in the Herbarium of Botany Department (KUH), Kakatiya University, Warangal, Andhra Pradesh, India. The sorted information on ethnobotanical knowledge of tribal inhabitants is enumerated under alphabetically by botanical names of plants, name of the family is given in parenthesis and their local names, habit, distribution, and phenology are given.

**ENUMERATION**

*Ceriscoides turgida* (Roxb.)Tirvengadam (Rubiaceae)
Vern.: Tella velaga kaya
An armed deciduous tree.
Occasional in dry deciduous forests
Fl.: & Fr.: Mar.-Jul.
Fruits edible, fruits are cooked and taken in Anaemia and constipation

*Phyllanthus reticulatus* Poiret in Lam. (Phyllanthaceae)
Vern.: Pulicheru
Large shrub.
Common in hedges and at the foot hills of forests.
Fl.&Fr.: July-March
Roots of *Phyllanthus reticulatus* and bark of *Aegle marmelos* (Maredu), grinded with fruits of *Feronia elephantum* (Velaga kaya) in water and given in Diarrhoea.

*Plumbago zeylanica* L. (Plumbaginaceae)
Vern.: Chitramoolamu

Annual erect herb.

Occasional in waste lands, hedges and forests.

Fl.&Fr.: Sept.-Dec.

Roots are grinded with water and paste is applied on wounds and warts

*Buchanania axillaris* (Desr.)Ramam (Anacardiaceae)

Vern.: Pedda morli

Medium sized tree.

Occasional in hilly forest areas in all districts.

Fl.&Fr.: June-Dec.

Gum swallowed in the form of tablets in chest pain and body pains

*Shcleichera oleosa* (Lour.)Okem. (Sapindaceae)

Vern.: Pusuku

Large deciduous tree.

Common in dry deciduous forests.

Fl.& Fr.: Jan.-Apr.

Stem bark is grinded with milk, and paste is applied on wounds

*Litsea glutinosa* (Lour.)C.B. Robinson (Lauraceae)

Vern.: Nara mamidi

Moderate sized evergreen, very variable tree.

Common in hill forests.

Fl.&Fr.: June-April.

Crushed stem bark is bandaged on broken limbs

*Cassia occidantalis* L. (Caesalpiniaceae)

Vern.: Namili vittulu

Erect, glabrous undershrubs.

Common in all plains.

Fl.& Fr.: throughout the year

Seeds are grinded and paste is applied in conjunctivitis

*Urginea indica* (Roxb.) Kunth. (Lilliaceae)

Vern.: Nall ulligadda

Bulbous herb.

Occasional in plains and on hills.

Bulbs are crushed and taken in fevers

*Lannea coromandelica* (Houtt.)Merr. (Anacardiaceae)

Vern.: Dumpidi

Large deciduous tree.

Common in deciduous forests.

Fl.&Fr.: Mar.-May.

Stem bark is grinded, paste is applied on wounds and used as galactagogue

*Cissus quadrangularis* L. (Vitaceae)

Vern.: Nalleru

Rambling shrubs.

Common in scrub jungles, wastelands.

Fl.& Fr.: June-Dec.

Whole plant is crushed and used as bandaged on wounds

*Azima tetracantha* Lam. (Salvadoraceae)

Vern.: Uppu-chekka

Straggling, armed, bushy shrub.

In hedges, thorny scrub jungles.

Fl.&Fr.:

Root bark is grinded, with the stem bark of *Dichrostachys cineraria* used, and fermented and take one glass of juice in early morning with empty stomach in Rheumatism.

*Madhuca indica* J. Gmelin (Sapotaceae)

Vern.: Ippa chettu

Large deciduous tree.

Abundant in forests, occasional on hills and in villages.

Fl.&Fr.: March-Sept.

Stem bark crushed with Cow urine and taken in Arthritis.

*Celastrus panicualtus* Willd. (Celastraceae)

Vern.: Maneti teega

Climbing shrub.

Common in dry forests.

Fl.&Fr.: Apr.-Dec.

Seed oil is applied in Knee-pains and Paralysis

*Pongamia pinnata* (L.)Pierre (Fabaceae)

Vern.: Kanuga

Medium sized, evergreen tree.

Common along river banks, often planted.

Fl.&Fr.: Feb.-Oct.

Seed paste is applied in Scabies

*Abrus precatorius* L. (Fabaceae)

Vern.: Guruvinda

Stragglers.

In hedges and among bushes in open lands.

Fl.&Fr.: July-Dec.

Seed paste is applied on swellings to heal.

*Phyllanthus emblica* L. (Euphorbiaceae)

Vern.: Usiri

Medium sized tree.

Common in dry deciduous forests/cultivated.

Fl.&Fr.: Oct.-Dec.

Fruit juice is mixed with Garlic juice is dropped in dental problems.

*Calycopteris floribunda* (Roxb.)Poiret in Lam. (Combretaceae)

Vern.: Teega dhari, Bonth teega

Scandent climbing shrub.

Common in dry deciduous forests.

Fl.&Fr.: Feb.-May.

Root bark is grinded with roots of Ellipta prostrate L. , used in Snake bite

*Cassia fistula* L. (Caesalpiniaceae)

Vern.: Rela

Small deciduous tree.

Common in deciduous forests.

Fl.&Fr.: Mar.-Dec.

Stem bark paste is applied on Scorpion bite

*Cassia tora* L. (Caesalpiniaceae)

Vern.: Tagirisa

Annual herbs.

Common in all plains, fallow lands, and in forest undergrowth.

Fl.& Fr.: Sept.-Dec.

Leaves are cooked and eaten in Anaemia

*Soymida febrifuga* (Roxb.)A.Juss. (Meliaceae)

Vern.: Somida

Lofty glabrous tree.

Common in the dry forests of most districts.

Fl.&Fr.: Apr.-Oct.

Bark crushed with water to control dysentery and Cough

## RESULTS AND DISCUSSION

There are 20 medicinal plants, including the six ethnoveterinary species, used by the tribal people in the revenue *mandal*. They are mainly used in the chest pain, Anaemia, Snakebite, Scorpion bite, Conjunctivitis, diarrhoea, indigestion, and rheumatism etc. Of the species, 10 are trees, 4 shrubs, 4 climbers, and 2 herbs. Of the list, usually there one species each of a family but for Caesalpiniaceae, which has three while Euphorbiaceae, Papilionaceae, Anacardiaceae represent with two species each. Of the plant parts used, stem bark is used in most of the preparations, followed by root, leaf , fruits, seeds and bulbs. Root paste of *Plumbago zeylanica* is used to relieve pains. Leaf juice of *Bauhinia racemosa* is dropped in Conjunctivitis. Gum of *Buchanania lanzan* is used for chest pain. Seed oil of *Celastrus paniculatus* is applied in Rheumatism. Root paste of *Calycopteris floribunda* is useful in snake bite. Crushed bark of *Cassia fistula* is applied on scorpion bite. Most of the medicinal plants are used singly. This data provide basic source for further studies aimed at conservation, cultivation, improvement of traditional medicine and economic welfare of rural and tribal population of the region

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# Effect of fruit extract of Aegle *marmelos* on intestinal transport of fluid and motility in rats

Manjunath V Jali*, Nirmala P[1], Annamalai A. R[1], Basavaraj K.M[2].

*Department of Pharmacology, T.V.M. College of Pharmacy, Bellary, Karnataka, India

[1]Department of Pharmacology, R. M. Medical College, Annamalai nagar, Tamilnadu, India

[2]Department of Chemistry, Vijayanagar Sri Krishndevaraya University Bellary, Karnataka, India

## ABSTRACT

The present investigation was undertaken to study the effect of alcoholic extract of Aegle marmelos fruit (AME) on castor oil induced intraluminal fluid, electrolyte accumulation in jejunum and intestinal motility in rats. Enteropooling method is used to measure movement of fluid and electrolyte from 2ml of tyrode solution placed in jejunum (20 cm) of anesthetized rats in 30 min period. Intestinal transit of charcoal meal is used to assess intestinal motility in rats. In control rats there was net absorption of fluid and electrolyte (Na+,Cl-), whereas, fluid and electrolyte accumulation was observed in castor oil group compared to control. Pretreatment of rats with higher dose of AME (800 mg/kg,p.o.) significantly prevented castor oil induced fluid and electrolyte accumulation, whereas the lower dose (400 mg/kg) had no effect. Both doses of AME (400 and 800 mg/kg) significantly reduced the intestinal transit of charcoal meal compared to control rats. Our results provide experimental evidence and rationale for antidiarrhoeal effects of Aegle marmelos fruits.

Key Words: Aegle marmelos, ejunalfluid, intestinal transit, Antidiarrhoeal activity

## INTRODUCTION

Secretory diarrhoea is common form of acute diarrhoea continues to be a major clinical problem has a major impact on morbidity and mortality worldwide. Secretory diarrhoea occurs as result of increased intestinal secretion or decreased intestinal absorption of fluid and electrolytes, but in some cases diarrhoea may result from a combination of these mechanisms 1, 2. There has been a continuing search for drugs that might inhibit secretory process within the enterocytes. Further altered motility of gastrointestinal tract also leads to diarrhoea 3.Aegle marmelos commonly known as Bael/Bilva belonging to the family Rutaceae has been reported to possess a

number of medicinal properties used in indigenous system of Indian medicine 4. Extensive studies have been reported on biological activities of various extracts of Aegle marmelos including antidiabetic 5, antiulcer 6, anticancer 7, antihyperlipidaemic 8, anti spermatogenesis 9. Previous report has demonstrated that fruit extract of Aegle marmelos is effective against castor oil induced diarrhoea in mice 10. Further our preliminary study in laboratory has demonstrated that ethanolic extract of unripe fruit of Aegle marmelos (AME) is effective against various secretagogues induced diarrhoea in mice (unpublished data). To our knowledge the effects of AME on intestinal fluid transport is less reported.

Enteropooling technique that measures fluid and electrolyte movement across various segments of small intestine is widely employed to test the antidiarrhoeal effects of investigating agents on intestinal fluid transport in physiological or pathological state 11. Castor oil stimulated intestinal secretion that results in the diarrhoea is commonly used in experimental antidiarrhoeal studies12. Further, the transit of charcoal meal along gastrointestinal tract after its oral administration is considered as measure of gut motility.

In present study we investigated the effect of AME on castor oil induced fluid and electrolytes secretion by enteropooling method in rat jejunum. We also investigated the effect of AME on intestinal motility by measuring intestinal transit of charcoal meal in rats.

**MATERIALS AND METHODS**

Chemicals

Castor oil IP grade (Boom Agro India Private Limited, Mundra, Gujarat), Thiopental Sodium (Harris Pharma LLP, Kolkata, India). Tyrode and other solutions were of extra pure quality available from commercial sources.

Plant Material

The unripe fruits of Aegle marmelos were collected from local areas of Bellary district, Karnataka, during July-September. The plant material was taxonomically identified and authenticated by Dr. Govindraj, HOD, Department of Botany, Smt. A.S.M. College for Women, Bellary, Karnataka, India.

Preparation of crude extract

Freshly collected unripe fruits of Aegle marmelos were thoroughly washed under running water to remove adherent impurities. Fruits were chopped and the pulp along with pericarp and seeds were subjected to shade drying at room temperature and coarsely powdered (#40). The powdered drug (100g) was macerated with 16 parts of ethanol (90%) for a week and filtered. The obtained extract was concentrated in a rotary vacuum evaporator under reduced pressure to obtain a dark brown semi-solid mass. The percentage yield of the extract was 12.64 % w/w with respect to air dried plant material. The extract was stored at low temperature (4 to 80 C) for evaluation of phytochemical, toxicological and pharmacological studies.

Phytochemical Screening

In order to determine the presence of phytoconstituents, a preliminary phytochemical study of the extract was performed using specific reagents 13

Experimental animals

Wistar rats of either sex weighing 200-225g were procured from Venkateshwara enterprises, Bangalore. They were housed in polypropylene cages and maintained under standard laboratory conditions (12:12 h light and dark cycles; temperature 25±20C and relative humidity 55±10%). Animals were fed with standard diet and water ad libitum. Before the experimental study the animals were fasted overnight with free access to water. The study protocol was approved by Institutional Animal Ethics Committee and experiments were performed in accordance with the current guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) 14.

Acute toxicity (LD50) study

Acute toxicity study of the extract was performed in overnight fasted albino mice by following fixed dose method as per OECD guidelines No.423. Mortality & toxic symptoms in the treated animals were observed continuously for the first 3 h after dosing, periodically during the first 24 h and then daily observation for a total period of 14 days 15.

**EVALUATION FOR ANTI-DIARRHOEAL ACTIVITY**

Study of intra luminal transport of fluid and electrolyte

Rats were divided into four groups of six animals each. Group I received vehicle (0.4 ml -2% Tween 80 p.o) and served as control. Group II and III received castor oil (2 ml p.o.) and in addition Group III and IV received AME (400 and 800 mg/kg p.o. respectively) 1h before oral administration of castor oil. All the groups were prepared for Beubler enterpooling method with modifications, briefly16. After 90 min from administration of castor oil animals were anaesthetized with Thiopental (40 mg /kg i.p.) and a midline incision was made, jejunum about 5 cms distal to the flexuraduodenojejunalis and 20 cms distally was canulated with polythene catheters (No. 8).The jejunum was rinsed with warm sterile saline solution to remove the contents followed by blowing air with using syringe. The distal end of the jejunum was closed by ligation. 2ml of pre warmed (37oC) Tyrode solution (composition g/l : NaCl-8.0, KCl-0.2, CaCl2-0.2, MgCl2-0.1, NaHCO3-1.0, NaH2PO4-0.05, D-glucose-1.0) was instilled in jejunum and catheter was withdrawn before tying of the proximal end. After 30 min the jejunum was removed and the volume of the fluid content was noted. Animals were sacrificed by an overdose of Thiopental. The fluid and electrolyte transport were measured as difference between the initial and final volume in the loop.

Intestinal transit of Charcoal meal

Wistar rats of either sex (200-225g) were randomly divided into four groups of six rats each. Group I received vehicle (0.4 ml -2%Tween 80 p.o.), Group II and III were received orally 400 and 800 mg/kg body weight of AME respectively. Group IV received standard drug atropine (0.1mg/kg i.p.). After 1 h each animal was administered orally with 1 ml of charcoal meal (10% charcoal suspension in 5 % gum acacia). Thirty minutes later the rats were sacrificed and the distance travelled by charcoal from pylorus was measured and expressed as a percentage of total length of the intestine from the pylorus to caecum 17.

Statistical analysis

Result are expressed as mean ± SEM (n=6). Statistical difference between control and experimental values were analyzed by one-way analysis of variance (ANOVA), followed by Dunnet's t-test (Graph Pad software). $P<0.05$ were considered statistically significant.

## RESULTS

### Phytoconstituents

Preliminary phytochemical analysis of the ethanolic extract of Aegle marmelos revealed the presence of tannins, steroidal glycosides, flavonoids, alkaloids, coumarins and terpenoids.

### Acute toxicity study

Acute toxicity studies were carried out to evaluate toxicity and to determine the minimum lethal dose of the test extract using Swiss albino mice. Fixed dose method of OECD Guideline No.423 was adopted for toxicity studies. It was found that no mortality and changes in the behavior were observed up to dose 2000 mg/kg body wt. Therefore, 400 and 800 mg/kg p.o extract doses were selected for screening of anti-diarrhoeal activity.

### Study of intra luminal transport of fluid and electrolyte

In control rats, there was net absorption of fluid 1.16 ± 0.092ml). Chloride and sodium movement paralleled that of fluid 114 ± 3.48 (114 ± 3.48 mEq /L, Na+; 117.3 ± 3.07mEq/L C1-). Castor oil treatment led to fluid accumulation as indicated by significant increase in jejunal fluid volume (1.553 ± 0.055 ml) as compared to control. In these rats sodium and chloride levels were also significantly higher when compared to control (141.2 ± 5.3 mEq/L, Na+; 141.5 ± 2.4 mEq/L, C1-). AME at higher dose, (800 mg/kg) reversed the castor oil induced fluid accumulation to absorption as indicated by significant decrease in jejunal fluid volume (1.225±0.052 ml) compared to castor oil group. Sodium and chloride levels in Jejunal fluid were also significantly reduced compared to castor oil received group (117.33 ± 3.2mEq/L, Na+; 126.6 ± 4.79 mEq/L C1-). Lower dose of AME (400 mg/kg) had no effect on castor oil induced fluid accumulation and C1- secretion but significantly reduced the Na+ level (1.36 ± 0.047 ml; 128.66 ± 1.52 mEq/L, Na+; 140.33 ± 4.29 mEq/L, C1-). Fluid and electrolytes accumulation in the Jejunum as shown in Figure-1, 2 and 3.

### Intestinal transit of charcoal meal

Pretreatment of rats with AME (400 and 800 mg/kg) significantly reduced the intestinal transit of charcoal meal (64.83 ± 3.96 and 54.4 ± 1.25 respectively) as compared to control (88.09

± 3.36). Similarly, atropine treatment also significantly reduced intestinal transit of charcoal meal (32.03 ± 1.25) compared to control as shown in Figure-4.

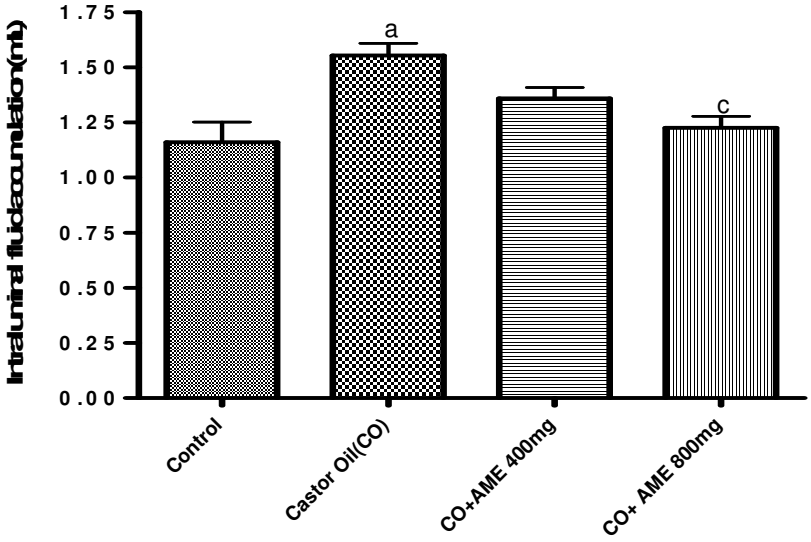


Figure 1 Effect of Aegle Marmelos fruit extract (AME) on castor oil (2ml p.o) induced elevated intraluminal fluid accumulation. Data are expressed as Mean± SEM for six experiments. ap < 0.01 when compared to control, cp < 0.01 when compared to castor oil.

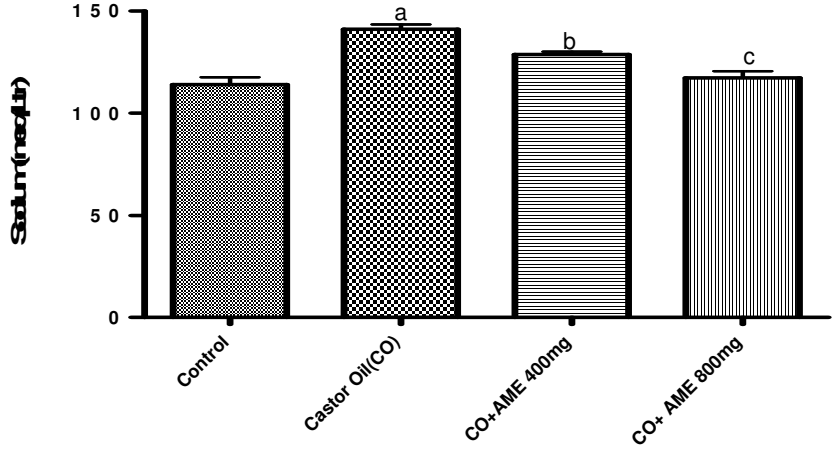


Figure .2 Effects of Aegle Marmelos fruit extract (AME) on castor oil (2ml p.o) induced elevated sodium level. Data are expressed as Mean± SEM for six experiments. ap<0.01 when compared to control, bp < 0.05 & cp < 0.01 when compared to castor oil.

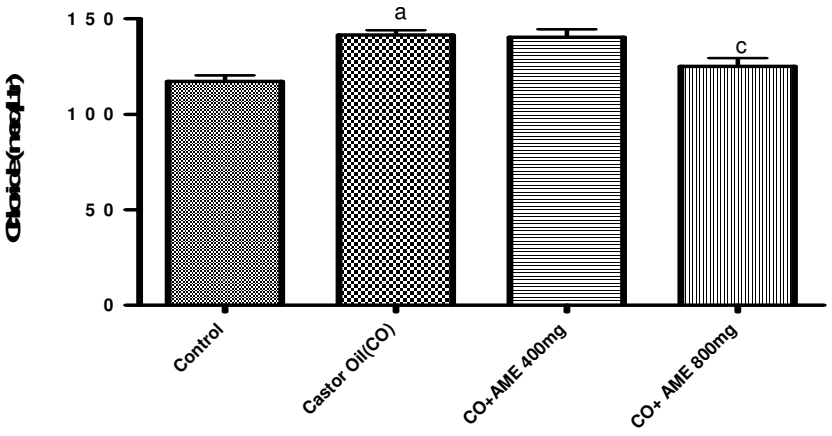


Figure .3 Effects of Aegle Marmelos fruit extract (AME) on castor oil (2ml p.o) induced elevated chloride level. Data are expressed as Mean± SEM for six experiments. ap < 0.01 when compared to control, cp < 0.05 when compared to castor oil

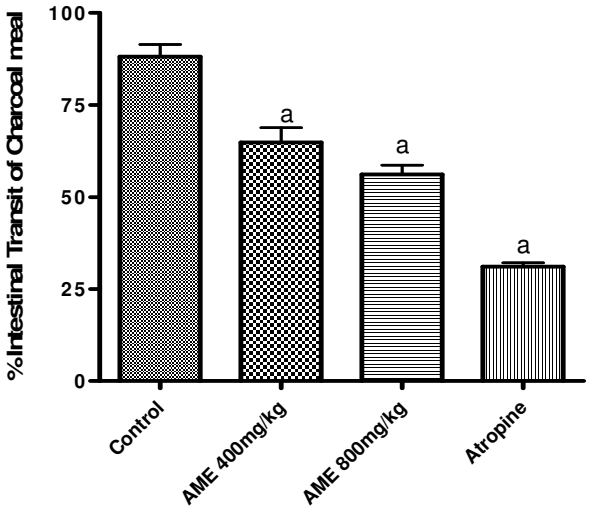


**Fig. 4 Effect of Aegle Marmelos fruit extract on intestinal transit of charcoal meal. Data are expressed as Mean± SEM for six experiments. [a] p<0.01 when compared to control.**

## DISCUSSION

In the present study, we have shown that AME prevents castor oil induced fluid accumulation in rat Jejunum. Further, the plant extract also inhibits charcoal meal transit in rats. Castor oil and its active ingredient ricinoleic acid change the transport of water and electrolytes to net hyper secretory response that results into diarrhea 18, Consistent with these reports, in the

present study we observed that castor oil induced the fluid and electrolytes (Na+, C1-) accumulation in Jejunum in 30 min period. In human intestine chloride serves as primary ion driving secretion of water into lumen and sodium serves key for regulating water absorption into lumen 19. Hence, we used this 30 min period to assess effect of AME on castor oil induced fluid and electrolyte accumulation.

Pretreatment of rats with AME prevented the castor oil induced fluid accumulation along with decreased levels of Na+ and C1- in intraluminal fluid. These observations indicate that AME has modulatory effect on castor oil induced changes in intestinal lumen that affects fluid and electrolyte transport.

Diarrhoea is also caused by changes in gastrointestinal motility that results into enhanced movement of intestinal contents. Drugs like atropine and loperamide are known to reduce the intestinal motility and are clinically used in treatment of diarrhoea 20. We observed that AME treatment in normal rats reduced the intestinal transit (54.4%) which was little lower than that of atropine (32%). These observations suggest that AME has inhibitory effect on intestinal motility. Based on our observations it appears that anti-diarrhoeal effect of AME observed in the previous study could be due to modulatory effect on intestinal transport of fluid and electrolytes and also intestinal motility.

**CONCLUSION**

Our results demonstrate that AME prevents castor oil induced intestinal accumulation of fluid and electrolytes. Further, it also reduces intestinal transit in normal rats. These observations provide experimental evidence that support anti-diarrhoeal effect of Aegle marmelos.

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# ABOUT EDITOR

**Dr.Samineni.Rama Mohana Rao** is an experienced lecturer in Botany- Spanning the Career of almost three decades. He is a man of sound academic and technical Qualifications with a penchant for Ethno- Botany, so much so that, he was specially Deputed as a team leader by the Forest Department Rapid Action Force to explore the Medicinal Plants in The V.R. Puram Mandal Of Khammam District. Besides, He is a Man of varied interest and positive zeal for any work assigned to him.To his credit he Has many research papers, that testify his keen interest for research activity. In brief, He is a teacher who does affect, who ever comes under his spell.