2016 - 2017 Annual Report





The University of Trans-Disciplinary Health Sciences and Technology

ANNUAL REPORT 2016 - 2017





The University of Trans-Disciplinary Health Sciences and Technology



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Vice Chancellor Message

We are a young University and therefore, I believe, in our formative years our primary focus must remain on research and social outreach. I know that the question from lay persons when being introduced to a University is what courses do you offer ? Perhaps the reason for such expectation, of courses, first is the fact that many educational institutions that have mushroomed in the last 20 years, engage exclusiv, ely in only imparting standard courses (with content divorced from social space and time), classroomteaching and conventional examination systems that test recall rather than fundamental understanding of domains and problem solving skills. They have been likened to educational factories. Human values in education are also neglected and by default educational institutions promote the same narrow ethics that one sees in the society in general.

Thus, the organic growth of a University, in my view, has a sequence. The knowledge journey must start with relevant research leading to application into social outreach and finally translating into educational programs that reflect social reality and current and future social needs.

When education is not founded on understanding of social needs, it is likely to have limited impact on building of young leadership for social transformation.

In fact, the most outstanding universities globally have had a long innings in research before designing educational programs at the undergraduate and postgraduate level and, therefore, the idea of a research university is a progressive one.

Graduating over the years into a teaching cum research university, I certainly do expect TDU to start educational initiatives in the near future. But my own sense is that, such initiatives, to begin with, should focus on PhD, which TDU has already started, and Master's by Research programs.

I welcome critical comments on the research and social outreach initiatives of TDU outlined in this annual report.

Darshan Shankar Vice Chancellor

Dignitaries Visit



Inauguration of the Ambulance by Her Highness Pramodadevi Wadiyar supported by Canara Bank



Maharani Pramoda Devi planting a medicinal tree at IAIM campus



Medical camp held at Vidhana Soudha



Medical camp held at Golahalli Govt School





I-AIM Hospital



Treatment Room



General wards





Canteen



TDU has a fraternal relationship with the Institute of Ayurveda and Integrative Medicine (I-AIM) since both TDU and I-AIM are creations of the FRLHT Trust. I-AIM's health services are managed by the FRLHT Trust, the I-AIM research and education staff is faculty of TDU.

The I-AIM Healthcare Centre campus is uniquely landscaped with over 1200 species of medicinal plants. It has 12 specialty departments each managed by expert clinicians guided by experienced and seasoned professionals. Its strengths are its caring professionals – 10 Senior Doctors, 15 Medical Officers, 40 Therapists, 20 Nurses and total strength of close to 150 people. The 100-bedded hospital is equipped with accommodation facility suitable for all strata of society (starting from General ward, Semi-Private, Private, Semi-deluxe, Deluxe and Suite).

The health services offered by I-AIM relate to the departments as listed below:

• Dermatology (Twacha roga)

The dermatology department treats conditions such as psoriasis, atopic dermatitis, eczema, lichen planus, acne, seborrheic dermatitis, herpes, vitiligo, pigmentation disorders, hair disorders (diffuse hairfall, dandruff, alopecia), urticaria, dry skin and tinea infections.

• ENT and Ophthalmology (Shalakya Tantra)

Ear disorders (hearing problems, vertigo, labyrintis, tinnitus, ear infections, etc.), Nasal disorders (deviated nasal septum, sinusitis, rhinitis, snoring problems, nasal allergies and infections, common cold and cough, etc.), and Throat and Oral Cavity Disorders (tonsillitis, laryngitis, pharyngitis, gingivitis, toothache, stammering, jaw problems etc.) are treated by the doctors in the Shalakya Tantra department. Ophthalmological symptoms like refractive errors, immature stages of cataract, diabetic retinopathy, age related macular degeneration, allergic eye disorders, stye, computer vision syndrome, glaucoma, squint etc. are also handled by this department.

• Gastroenterology (Udaragath Roga)

Conditions treated by this department include acid peptic disease, chronic constipation, chronic diarrhea, irritable bowel syndrome, anemia, jaundice, liver disorders, fever and peptic ulcers.

• Geriatrics (Jarachikitsa, Rasayana and Vajikarana)

The department looks at diseases in the elderly (people above the age of 50 years). The focal areas looked at include Musculoskeletal conditions like osteoarthritis, osteoporosis, rheumatoid arthritis etc., Neuro and Neurodegenerative conditions like stroke, palsy, Parkinson and Parkinson group of degenerative conditions, Integrative cancer care, Integrative Cardiology and Male infertility.

• Nephrology (Mootra Roga)

If you have chronic kidney disease, pyelonephritis, diabetic nephropathy, urethral stricture, nephrotic syndrome, urinary tract infections (UTI) or hydronephrosis, this is the department to consult with at I-AIM.

• Neuromusculoskeletal (Kayachikitsa)

Conditions treated by the Kayachikitsa department include cervical spondylitis, lumbar spondylitis, disc prolapse, paralysis, cervical spondylosis, frozen shoulder, epilepsy, rheumatoid arthritis, Bell's palsy, osteoporosis and Sacroiltis.

• Obstetrics and Gynecology (Prasoothi and Stree Roga)

The conditions treated by this wing include menorrhagia, abnormal uterine bleeding, infertility, premenstrual syndrome (like breast pain and heaviness, mood swings, irritability), PCOS (Polycystic Ovarian Syndrome), Recurrent Pregnancy Loss, Uterine Fibroids, Polyps, Ovarian Cysts, etc. It also offers pre-conceptional care, Ante-natal care, Post-natal care, Ayurvedic interventions to promote natural birthing and looks at Integrative approach towards complication during pregnancy.

• Pediatrics (Koumarbhrithya)

Neurological symptoms like cerebral palsy, mental retardation, autism, epilepsy, West syndrome, Down's syndrome, Rett's syndrome, learning disability etc., Symptoms related to allergy and asthma, skin conditions like allergic eczema, ichthyosis, leukoderma etc. in children are handled by the pediatrics department. It also offers Swarna Bindu Prashana for general immunity for 1 month to 16 year olds, especially on the day of pushyanakshatra.

• Respiratory/Pulmonology (Shwasa Roga)

Conditions treated under the Shwasa Roga department include Common cold, Cough, Tonsilitis, Laryngitis, Pharyngitis, Allergic Rhinitis, Allergic Bronchitis, Asthma and Chronic Obstructive Pulmonary Disease.

• Surgery (Shalya Tantra)

The Shalya Tantra department offers the following services:-

- General Surgery: Covers all types of wounds, ulcers, abscess and Cellulitis; any
 growths/lumps and swellings in the body; stones in kidney, gall bladder, pancreas, thyroid
 growths, undiagnosed pain abdomen, peptic ulcer, hiatus hernia; hernia (like complaints of
 pain, lump and growth in the inguinal area, abdomen including umbilicus), hydrocele,
 appendicitis, urinary tract problems like Kidney stones, BPH (benign prostatic hypertrophy),
 Prostatitis, urethral strictures, urinary incontinence, infections (UTI, pyelonephritis) and
 hydronephrosis; Phymosisand paraphymosis; and undescended testes.
- Ano Rectal Surgery (Integrative Proctology): covers hemorrhoids (piles), Fistula in ano, Fissure in ano, Polyps and papillae in anal and rectal area, Rectal prolapse, Abscess (pus collection), Pilonidal Sinus, Constipation; and any other benign growths in anal area (warts, tags).
- Orthopedic Surgery (Integrative Orthopedic & Sports Surgery): For fractures, dislocations, sprains, osteomyelitis, Calcaneal spur, Arthritis, Avascular necrosis, Vertebral disc problems (like IVDP, Sciatica, Low back pain and Spondylitis)

- Surgery for Sports Injuries: Ligament tear, Meniscal and tendon injuries, Tennis elbow/ tendinitis, Bursitis, Plantar fasciitis and Baker's cyst
- Vascular Surgery (Integrative Vascular Diseases): For varicose veins, DVT(Deep Venous Thrombosis), SVT(Superficial Venous Thrombosis), Atherosclerosis, Diabetic vasculopathy, Arterial obstructions, Gangrene, Raynaud's Phenomena, TAO, and Vascular ulcers.

Dental

I-AIM offers a wide range of general dental treatments ranging from Indirect Pulp Capping, to Bleaching, Fluoride Application, Prosthodontics, Orthodontics, Extraction, Pedodontics, Habit Breaking Applications etc. It also offers general periodontics treatments like scaling, operculectomy, gingivectomy, depigmentation, flap surgery and mucogingival surgeries.

• Treatment for Metabolic disorders like Diabetes, Obesity, High Cholestrol and Hypertension

• Wellness Services (Swasthavritha)

The objective of the check-up at I-AIM is to assess through a questionnaire supported by clinical examination by a physician, the health status of an individual. The check-up takes about 45-60 minutes. It evaluates parameters that indicate the quality of following 6 functions viz., physiological, tissue formation, metabolism, excretion, sensory & mental. Consultation also involves taking history pertaining to present medications, family history of illness, evaluations of risk factors and assessment of objective indicators like blood pressure, height & weight etc. An individual can be assigned a base-line wellness score. This score can help the individual and physician to decide on customized wellness interventions and subsequently monitor progress.

The Swasthavritha department also offers individualized nutritional advice and annual wellness packages for health maintenance.



Period 01 Apr 2016 - 31 Mar 2017



Stroke patient before treatment



Stroke patient after 21 days of treatment



CSR Funding Activities

Name of Project:	Menzies Aviation Bobba Poor Patient Fund		
Investigator			
- Principal investigator	Mr Rejimon		
Total duration of the project	1 Year		
Funding Agency	Menzies Aviation Bobba Pvt LTD, Bangalore		
Total funding	Rs 20,00,000/-		
Funding during the year 2016-17	Rs 20,00,000/-		
Status	Completed		

Report

The Hospital utilized Menzies Aviation Bobba Pvt LTD CSR fund for providing healthcare services for poor patient and to provide high subsidy to patient who come at IAIM for their healthcare management.



CSR Funding Activities

Name of Project:	Improving quality of OT<, DENTAL and ENT Department of I-AIM		
Investigator			
- Principal investigator	Dr. Mahadevan Seethraman		
Total duration of the project	6 Months		
Funding Agency (ies)	THE HANS FOUNDATION, New Delhi		
Total funding	Rs.38,79,000/-		
Funding during the year 2016-17	Rs.38,79,000/-		

Report: The project grant helped I-AIM to equip with the necessary OT, Dental and ENT equipment which in turn helps I-AIM to take care of more EWS patients.



CSR Funding Activities

Name of Project:	KK - Agarwal Fund		
Investigator			
Principal investigatorCo-Investigators:	Dr. Shreelatha Subrahmanya Dr. B N Prakash, Dr. Neelambika		
Total duration of the project	3 Years		
Funding Agency (ies)	Mr. KK Agarwal		
Total funding	Rs. 9,00,000		
Status	Completed		

Report: The survey was conducted in Gollahalli Gramapanchayat consisting of 23 villages with the total population of 5779. Among them, 1744 were aged 40 yrs and above. Majority of the participants were male, uneducated, socio-economically come under below poverty level and they depend on agriculture and cooli for their daily income. Majority of them reported joint pain, fever and respiratory conditions. In the clinical screening survey, 13.6% participants were having high BMI, 76.70% participants had high blood pressure. Only 3.99% were diabetic and majority of them had osteoarthritis specially knee OA (68.63%)



School of Health Sciences



Products prepared by LRPs



treatment for mastitis



Training of LRPs (Practicals)





Training of Farmer's from Karnataka



Ethnoveterinary Practices

1. Training of trainers in Ethno-Veterinary Practices (EVP)

A. Veterinarians, extension Officers and LRPs

Relevance (scientific/social) of the project

The excessive and indiscriminate use of antibiotics in human, agriculture and animal health care, and the contemporary health care strategies have resulted in the creation of antimicrobial resistance. In addition to increasing drug resistance, these methods have led to avoidable side effects and allergic reactions on consumers who consume animal products such as milk and meat. In India, in the past 5 years, the annual rate of use of antibiotics is rising by 6-7 %. About 90% of the antibiotics given to humans, crops and the livestock end up in the environment. It is estimated that by 2050, the antimicrobial resistance (AMR) will cause 10 million deaths per year

With limited or no strategic implementation of regulatory and policy focus on reducing and controlling the use of antibiotics, the focus needs to shift to working with farmers, animal keepers and veterinarians in identifying options to use ethno-veterinary practices that use natural products to control microbial diseases.

Highlights of progress/achievements

147 veterinarians, 10 extension Officers of different milk unions and 192 local resource people of Bangalore Milk Union and MILMA Malabar were trained to use ethno-veterinary practices for 15 clinical conditions in cattle. They have been given training for identifying the ingredients, preparation of the dosage form an application of the formulations.

B. Post Graduate Diploma in Ethno- Veterinary Practices

This programme was jointly conducted by TANUVAS and TDU only for veterinarians. This is an online one year programme with 10 days contact classes for each semester. In the year 2016-2017, 8 candidates received the PG Diploma.

C. DST supported Training of small dairy farmers in Kerala, Karnataka and Tamil Nadu on ethnoveterinary practices to reduce the antibiotic residue in the milk

The Objectives of the Project

- 1. To conduct base line and end line surveys in selected location to assess the awareness, knowledge & skill of using the Ethno-Veterinary Practices (EVP)
- 2. To estimate the expenditure on treatment of diseases in cattle using both conventional veterinary medicine & EVP
- 3. To find the quantity of commonly used veterinary drug (antibiotic) residue in the milk
- 4. To provide training to 100 farmers on ethno-veterinary practices to manage certain health conditions in cattle

Highlights of progress/achievements

Eight milk unions were selected in Kerala state with the help of MILMA (P&I of ERCUMP) Ernakulam.

- 1. Allappara Kheera Ulpadaka Society
- 2. Arakkappadi Kheera Ulpadaka Society
- 3. Chakkampuzha Kheera Ulpadaka Society
- 4. Maneed Kheera Ulpadaka Society
- 5. Manikyamangalam Kheera Ulpadaka Society
- 6. Monippally Kheera Ulpadaka Society
- 7. Puthrika Kheera Ulpadaka Society
- 8. Sreemoolanagaram Kheera Ulpadaka Society

Hundred and sixty farmers were selected from all society.

Phase 1

Base line survey has been conducted for 80 farmers from Manned, Monipally, Chakkampuzha and Putrika for Knowledge, aptitude and practice of EVP on a format with 1 to 10 scale.

Baseline study on Knowledge, aptitude and practice (KAP) among farmer's on Ethnoveterinary practices (EVP), antibiotic and veterinary drug residue in the milk and Antimicrobial resistance (AMR)

NOTE:

K- KNOWLEDGE, A- APTITUDE, P-PRACTICE

KNOWLEDGE SCORE	Frequency	Percent	
<50%	5	6.3	Poor
50%-75%	33	41.3	Average
75%-90%	39	48.8	High
>90%	3	3.8	Very high
Total	80	100.0	

Practice Score	Frequency	Percentage	Remarks
<50%	32	40.0	Poor
<50% - 75%	44	55.0	Average
75% - 90%	4	5.0	High
91%-100%	0	0	Ver High
Total	80	100.0	

APTITUDE SCORE	Frequency	Percent	
<50%	20	25.0	Poor
50%-75%	49	61.3	Average
75%-90%	11	13.8	High
91-100%	0	0	Very high
Total	80	100.0	

Four awareness programmes were conducted for 40 farmers. Handbook in Malayalam has been prepared and presented.

Publications/Research papers/ invited talks:

One day International conference on Veterinary Ayurveda conducted in West Bengal University of Animal and Fisheries Sciences (WBUAFS) on 1st Dec 2016.

Highlights of progress/ achievements

Totally 136 participants participated in the international conference 15 lead speakers, 10 oral presentations and 10 poster presentations in the conference

Books

- 1. M N B Nair, N. Punniamurthy & S.K Kumar, 2016 Ethno-veterinary treatment Guide, TDU, Bangalore (Malayalam)
- 2. S.K. Kumar, M N B Nair & N. Punniamurthy, 2016 Primary health care of animals and medicinal plants, TDU, Bangalore (Kannada)
- 3. Girish Kumar V. & M N B Nair, 2016 Medicinal plants & primary health care TDU, Bangalore, ISBN:978-93-84208-02-08
- 4. N. Punniamurthy, M N B Nair & S.K. Kumar, 2016 User Guide on Ethno-veterinary Practices. TDU, Bangalore, ISBN 978-93-84208-03-05

Conference

M N B Nair, N Punniamurthy & S.K Kumar. Role of Ethno-Veterinary Practices (EVP) in reducing of antibiotic residue & Antimicrobial resistance in livestock production system: a field experience, 63rd Annual Meeting and Congress of the Society for Medicinal Plant and Natural Product Research, Budapest, Hungary

M N B Nair, N Punniamurthy & S.K Kumar 2016.Contemporary relevance of Ethno-veterinary Practices (EVP) and Efforts by TDU & TANUVAS in Main streaming EVP. World Ayurveda conference, Calcutta

N Punniamurthy, M N B Nair, A decade of clinical research and applications of ethno-veterinary knowledge in India - the pragmatic way of facilitating medicinal plants to replace synthetics in animal health and production Planta Med 2016; 82(S01): S1-S381 DOI: 10.1055/s-0036-1596155

Team:

Dr. M N B Nair Dr. S.K Kumar Dr. N. Punniamurthy Dr. Girish Kumar. V



Public Health & Local Health Traditions

Development and evaluation of a community-based participatory model for sustained use of a copper device and other point-of-use practices for microbial purification of drinking water

Brief background:

Microbial pathogens in drinking water are known to be the single major cause of diarrheal illness. Improved water supply quantity and use of point-of-use (PoU) interventions can reduce diarrhoea morbidity by 30%. TDU has developed a cost-effective PoU copper device for reducing microbial contamination and diarrhoea among under five year old children.

Program/Activity description:

This study captured baseline knowledge, attitude and practices of rural communities in relation to drinking water collection, storage, usage and purification practice, sanitation and hygiene and explored perceptions in relation to drinking water quality and affinity towards solutions for purification of the same by household surveys, in-depth interviews and focus group discussions in three study sites.

Highlights of the progress/ achievements:

- The study pointed out that the mothers reported fever, cold and cough as the most common health problems in their children at two sites. Diarrhea features as an important issue in one site.
- A majority of mothers at two sites adopted cloth filtration at household levels for purifying their drinking water while boiling was reported to be commonly practiced at the third site.
- A majority of mothers at two sites were aware of traditional practices for purifying water such as the use of copper vessel.
- Govt. institutional health care providers as well as private health care providers were the most preferred choices by the communities surveyed for episodes of diarrhea in their Under 5 children.
- A majority of households at the three project sites considered the quality of drinking water received by them to be good or reasonable.

Publications/Research papers/invited talks

- A two-day communication workshop for the Project, along with the field partners, was held at Vivekananda Institute for Leadership Development (V-LEAD) campus, Mysuru, in the month of February 2017.
- A two-day research methodology training program in relation to the project was conducted at TDU campus in association with ICAR-NIVEDI in October 2016.
- A two-day hands-on project management software training program was conducted for the project team at TDU campus in November 2016.
- A one-day baseline survey preparatory workshop was carried out for the field partners at TDU campus in December 2016.

Team:

- Dr. Padma Venkat
- Mr. G. Hariramamurthi
- $Dr. \ Sarin NS$
- Dr. Prakash B.N.
- Mr. Tejas Chaudhary
- Dr. Santosh Halundi
- Ms. Lali B



Development of Digital Repository of Medical Manuscripts and Books of Karnataka

Brief background:

India has one of the largest collections of medical manuscripts (Manuscripts) of any civilization in the world, including many on traditional systems of Medicine. While there is no precise enumeration of the number of manuscripts, estimates vary widely, putting it in the region of 20,000 to 100,000 manuscripts. FRLHT-TDU has undertaken the task of cataloguing, digitizing, deciphering and in due course publishing these medical manuscripts along with translations and value-additions.

Program/Activity description:

The principal activity of the Medical Manuscripts Digital Repository programme is to:

- Develop an Electronic Descriptive Catalogue of all the medical manuscripts available in India (and in due course the entire world)
- Digitize important medical Manuscripts and old books and host them online so that the data can be preserved (for posterity) and universally

Highlights of the progress / achievements

I. Development of Customized software for Cataloguing / Digitizing / Editing and other tasks associated with the preservation and propagation of manuscripts, especially medical manuscripts

II. Cataloguing of Manuscripts

 Till date, more than 17000 manuscripts belonging to various Indian medical systems like Ayurveda, Siddha and Unani, available in various institutions across India have been catalogued. As per the available information, such an electronic descriptive catalogue for medical manuscripts has not been prepared by any Governmental or Non-Governmental agency, either in India or abroad.

III. Digitization of Manuscripts and Old books

- More than 1000 Manuscripts and old books have been digitized and uploaded to the Digital repository.
- Since the Manuscripts are digitized using high-end digital cameras and stored in the customized software, even if the original manuscripts are lost due to various reasons, the digital copies of the same will remain intact for many centuries to come and they can be deciphered, edited and published at one's own pace.

Team:

Prof. M. A. Lakshmithathachar Dr. M. A. Alwar Dr. Hemanth T. R Vidvan M. A. Ananth





Field Study -Tripura Forests





one-day hands-on training program



Village Botanist Training at Sittilingi



Bamboos as vegetable, Tripura



Infosys Project : Conservation of Medicinal Flora, associated with India's Medical Heritage

A consolidated account of the progress for the year 2016-17 (1/4/16 to 31/3/17)

Activity I: Analysis of Botanical data from three Talukas to develop a Taluka specific herbal pharmacopeia

- (a) Technical report with detailed analyses of the field data along with the survey and plant photographs has been finalized
- (b) The plants from Gudalur, Sittilingi and H.D. Kote were critically identified by using the Floras, Revisions and Monographs.
- (c) Scientific Publication: 2017). Ethnomedicines of Malayali tribes in Sittilingi hills, Harur Taluk, Dharmapuri district, Tamil Nadu. [Communicated and Accepted for publication in Journal of Economic and Taxonomic Botany].
- (d) The data from the floristic surveys has been linked to plant remedies and is accessible through a web based database, namely <u>http://www.pmchealthcare.in/</u>
- (e) Pilot-project to develop a local medicinal plants herbal pharmacopeia on an ICT platform (Advancement of healthcare at local levels using traditional knowledge in sync with modern database and analysis)

Activity II: Initiation of a "Geospatial Database" for wild medicinal plants of India

Developed a first cut Ecological Niche Modelling Map of *Saraca asoca* (an endangered and endemic medicinal plant of Karnataka) using the locations data culled from available literature, herbarium and field samples of Western Ghats to predict the potential zone of occurrence in North-east India using Maxent software.

Taluka level Geospatial Database of Medicinal Plants of Karnataka generated using the documented floristic diversity across 13 Medicinal Plants Conservation Areas (MPCA's) of Karnataka (960 species).

Taluka level Geospatial Database of Medicinal Plants of Kerala generated using the documented floristic diversity across 9 Medicinal Plants Conservation Areas (MPCA's) of Kerala (with 834 species) has been added to the earlier output generated for Karnataka (with 960 species). Thus field records of medicinal plants across 22 MPCA's of Karnataka and Kerala have been utilized to generate a geospatial database of medicinal plants presence in 22 talukas of these states

Activity III: Review and reassessment of conservation efforts in selected MPCAs established during 1994-98

(a) First round of field visits to the three selected MPCAs of Tamil Nadu has been undertaken with logistic support from TN Forest Department. These MPCAs are: **Kurumbaram** (Viluppuram district), **Thenmalai** (Tiruvannamalai district) and **Top Slip** (Coimbatore district).



Activity IV: Conservation Training

- (a) A refresher course for frontline forest staff, folk healers and members of Biodiversity Management Committees (BMKs) from Manipur (18th to 24th June 2016). Twenty two participants from Manipur attended and learned about the finer elements of Peoples Biodiversity Registers (PBR), Access and Benefit sharing (ABS) mechanisms and formation and role of BMCs in context of the Indian Biological Diversity Act and Manipur Biodiversity Rules (Dr. M. Abdul Kareem, Sri Narayan Prakash) The logistic support was provided by Manipur Biodiversity Board.
- (b) A study to document commercially utilized natural plant resources (medicinal plants) of Tripura
- (c) Field surveys in 53 local markets of Tripura resulted in identification of 1602 commercially utilized bio-resources pertaining to 462 plant species. 86 of these species have been earlier recorded in high volume trade (> 100 MT/year) at national level. Some of these can be potential candidates for cultivation in Tripura. The study has led to the identification of 18 species of Tripura with export potential which can be promoted through infrastructure development. (The logistic support for field work was provided by Tripura Biodiversity Board.
- (d) A program to sensitize school children on plant morphology, anatomy and conservation of medicinal plants. A one-day hands-on training program was designed and implemented on 1st July 2016 and 19th September 2016 for school children pursuing their secondary education. Around 80 students have benefited from the program (Dr. M. Abdul Kareem, Sri Narayan Prakash). Six one-day hands-on training programs were conducted during the month of November 2016 followed by five programs in December 2016 and one in January 2017 for school children in which overall 298 students participated. (Dr. M. Abdul Kareem, Dr.Noorunnisa Begum and Sri Narayan Prakash).
- (e) Capacity Building Training on Good Field Collection Practices and Production for Members of Chhattisgarh State Minor Forest Products, Co-operative Federation Ltd. of Chhattisgarh. A capacity building program for the members of Chhattisgarh State Minor Forest Products, Cooperative Federation Ltd was conducted in Bangalore on 27th March to 1st April 2017. Around 26 members participated in this program. This program mainly focused on good collection practices for the wild medicinal plants, their processing and packaging. The logistic support for conducting the program was provided by Chhattisgarh State Minor Forest Products Cooperative Federation Ltd. of Chhattisgarh
- (f) Communication material on Global Climate Change and its impact on Forest Resources, for the use of Frontline Forestry staff of Karnataka. A concept note and proposal to develop an Illustrated Primer in Kannada on Global Climate Change and Forestry resources for the use of frontline forestry staff of Karnataka, was submitted to The Environmental Management and Policy Research Institute (EMPRI) of Department of Forests, Ecology & Environment (Govt. of Karnataka) which has sanctioned a small grant. The manuscript of the primer has been finalized.



Activity V: The revised site on Home Remedies is now available for public with new graphical interface and additional contents which are easy to search. This is now available at http://www.homeremedy.in/English/index.php

Healing Remedies App-Version 0.1 has been released

A pilot android "mobile app" has been developed and released at Google Play Store: https://play.google.com/store/apps/details?id=frlht.Healingremedies&hl=en

Activity VI:

- (a) Preparation of a document on Properties and Healing Powers of plants, recorded in Traditional knowledge, for Sandhighatavata (Osteoarthritis)
 This has been made available on our website and linked as : http://www.indianmedicinalplants.in/Medicinal%20plants%20for%20osteoarthritis.pdf
- (b) Preparation of a document on use of Medicinal Plants for enhancing properties of drinking water based on classical Ayurvedic references This has been made available on our website as linked as: www.indianmedicinalplants.in/DrinkingWater_Report.pdf
- (c) Preparation of computerized database on Medicinal and Aromatic Plants of Tripura With logistic support provided by State Medicinal Plants Board of Tripura, a user friendly database has been prepared.

Team:

Mr. D.K. Ved Dr. Ravikumar K Dr. SN Venugopalan Nair Dr. M. Abdul Kareem Ms. Suma TS Dr. Noorunnisa Begum Dr. CR Jawahar Dr. Shilpa Naveen Ms. Sathya Sangeetha, Ms. Bhagya Lakshmi Dr. A.C. Tangavelou Dr. N. Dhatchanamoorthy Ms. Tabassum Ishrath Fathima Mr. Vijay Srinivas Dr. Vargheese Mr. Narayan Prakash



School of Conservation of Natural Resources



Training Program on good field collection practices

1. Village Botanists Course for Frontline Forest Staffs, Traditional Healers and Community Members of Chhattisgarh State

Project relevance: The Village Botanists course included all aspects of biodiversity like field botany, identification of plants, floral diversity, preparation of inventory, preparation of herbarium, vegetation monitoring, sustainable harvest, cultivation & conservation practices and establishment of enterprises. This program used different teaching methodologies including lectures, demonstrations, field exposure, documentation, accessing plant databases and evaluation spread over a period of six months.

Highlights of progress: The first level was a three-day orientation program organized at Raipur which covered the systematic method of identification of plants, understanding medicinal plant diversity and threat faced by them, models for conservation, sustainable utilization and preparation of People's Biodiversity Registers (PBRs).

The second level was organised from 29th to 31st, August 2016 at Dhamtari. Participants were appraised about basic taxonomy, morphology, ecosystems, tools employed for conservation of medicinal plants, sustainable harvesting and documentation of Local Health Traditions. They were also given hands-on training in herbarium preparation and nursery techniques. A field exposure was organised as part of the program.

The third and fourth level course was organized from 5th to 11th, December 2016 at Bangalore. Twenty five village botanists attended the program.

Publications: A field manual and technical report *"Village Botanists Course for Frontline Staff of Forest Department and Traditional Healers of Chhattisgarh State".*

2. Training program on Good Field Collection Practices and Value addition of Medicinal Plants for medicinal plant Collectors and other stakeholders of Chhattisgarh State Minor Forest Produce (Trading and Development), Co-operative Federation Ltd

Project relevance : The collaboration with Chhattisgarh State Minor Forest Produce (Trading and Development) and Co-operative Federation Ltd., has developed a unique outreach program on Good Field Collection Practices and Value addition of medicinal plants for the stakeholders of federation. This training will enable the stakeholders to practice good harvesting techniques, knowledge of raw materials process such as drying, packing, storage techniques and transportation of medicinal plant products.

Highlights of Progress: Total 25 members of Chhattishgarh Co-operative Federation participated in five days training in the month of March 2017 held at Karnataka. The main focus of the training was to get exposures in the area of good collection practices in medicinal plant harvest methods and technologies, primary raw medicinal plants process, value additions, visit to Medicinal Plant Conservation areas and understanding herbal industries.

Team: Dr. M. Abdul Kareem Dr. K. Haridasan Dr. Subramanya Kumar Mr. Narayan Prakash and Ms. Amrita. G





MGNREGA officers during a technical session in the workshop

Community Primer on Climate Change: front cover and inside page



CONSERVATION, TRAINING & EDUCATION

Project 1: Capacity Building Course For Frontline Forestry Staff Of Chhattisgarh (supported by Chhattisgarh State Medicinal Plants Board, Chhattisgarh)

As a strategy to building field capacities among the frontline forestry staff in respect of identification, conservation and management of medicinal plant resources, TDU has been designing and delivering state-specific training courses in different states of India and offers training and mentorship support in sequential stages. During 2016-17, the team focused on Chhattisgarh state and the 1st level orientation training program was successfully conducted at the Forestry Training facility, Jagadalpur, Bastar during 17th to 19th October 2016.

Project 2: Special Training Workshop On "Medicinal Plants For Afforestation Programs Under MGNREGA Scheme": (under the CoE program of MoEF & CC, Gol)

Mahathma Gandhi National Rural Employment Generation Act (MGNREGA) is an innovative initiative of the Government of India, which aims at providing employment to rural communities. Developing community assets in rural areas is one of the key activities under this scheme and many activities with the involvement of departments of horticulture, agriculture, panchayat raj & rural development, irrigation and others are underway. Afforestation of wastelands and village commons with planting fuelwood tree species and perennial trees with multi-purpose values has been a popular large scale initiative under the scheme.

Twenty six key officers associated with MGNREGA scheme from Karnataka, Tamil Nadu, Andhra Pradesh, Pondicherry, Telangana and Maharashtra states took part in the program. Different priority subjects including, wild medicinal plants diversity, Non-Timber Forest Products (NTFP) as a source of livelihood for rural communities, possible models of including medicinal plants for livelihood and resource augmentation were covered during the program. Case studies based on earlier experiments and field activities by the TDU team were presented in addition to technical learning sessions by the in-house team and invited subject experts.

Project 3: Special Training Workshop On Geographic Information System (GIS) Applications & Working Plan Prescriptions For Medicinal Plants Conservation": (under Center of Excellence (CoE) program of MoEF & CC, Gol)

A special workshop on "GIS on GIS Applications & Working Plan prescriptions for Medicinal plants conservation" was conducted for senior officers and working plan officers from south India during 10-11th February 2017 at Bengaluru. The workshop was specially designed for assimilating high end research tools such as GIS applications (in the form of distribution maps, Eco-distribution maps) into working plan prescriptions for conservation of red listed medicinal plants. Twenty senior forest officers and working plan officers from Karnataka, Maharashtra, and Tamil Nadu forest departments, Karnataka Medicinal Plants Authority and Institute of Wood Science & Technology, Bengaluru took part in the program. Priority subjects such as, Medicinal Plants of conservation concern, current threats to medicinal plants & rapid threat assessment, GIS tools to facilitate informed conservation action, working plan prescriptions for management of medicinal plants.

Project 4: Develop a "Primer On Climate Change & Forest Resources For Use Of Forestry Staff Of Karnataka" (Supported by EMPRI-Environmental Management & Policy Research Institute, Govt. of Karnataka, Bengaluru)

To generate awareness on "Climate change and forest resources for use of forestry staff of Karnataka", TDU developed a community primer in Kannada

The prototype draft covered climate change, global warming, consequences of climate change, impact of climate change on forest resources, adaptation and mitigation mechanisms of climate change, illustrations and case studies of climate change research in forestry sector in India. The information has been presented in simple language and in an attractive style with sufficient examples and interesting illustrations. The prototype was field tested with a group of forest guards and foresters from Karnataka.

Presentation

 Somashekhar B Srikantiah. 2017. Climate Change Communication in vernacular language is a challenging proposition: Case study of developing a community primer in Kannada on Climate Change & Forest Resources to offset the information gap among the field forestry staff of Karnataka. Paper presented during the National seminar on "Climate change: challenges and solutions - 2017", 23 January 2017, EMPRI, Bengaluru.

Team: Mr. Somashekhar B S

External Resource Persons:

Dr. Vasudeva, Professor, Forestry College, Sirsi Dr. S Tukaram, Director, State Resource Centre, Mysore



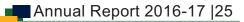
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Herbarium technique training program (1)



Herbarium technique training program (2)



Project - 1: Herbarium of Medicinal Plants Used in ISM (Indian System of Medicine)

Brief background: A National Repository of Medicinal Plants brings together the vernacular names and the currently accepted botanical name of a particular species, including the specific location (latitude, longitude, altitude) of its presence on the Indian territory. It also involves collection of morphological variation.

Strengthening of Herbarium: Addition of 150 medicinal plant species to herbarium (=500 voucher specimens) from Tamil Nadu, Kerala, Karnataka in southern India; Uttarakhand in northern Himalayan region and from Nagaland state in north east region.

S.N	Botanical Names	Families	Habit	Status
] و	Acalypha alnifolia Klein ex Willd.	Euphorbiaceae	Undershrub	Endemic to southern India
] و	Alysicarpus scariosus var. pilifer (Prain) A.Pramanik & Thoth.	Fabaceae	Herb	Endemic to Peninsular India
ى	Andrographis serpyllifolia (Vahl) Wight	Acanthaceae	Prostrate herb	Endemic to Peninsular India
لى	Asystasia crispata Benth.	Acanthaceae	Herb	Endemic to Peninsular India
_ي	Barleria acuminata Wight ex Nees	Acanthaceae	Herb	Endemic to India
اي	Barleria buxifolia L.	Acanthaceae	Undershrub	Rare
_ ڊ	Barleria longiflora L.f.	Acanthaceae	Undershrub	Endemic to southern India
_ ي	Barleria montana Nees	Acanthaceae	Undershrub	Endemic to Peninsular India
٦لا	Barleria mysorensis B.Heyne ex Roth	Acanthaceae	Undershrub	Endemic to southern India
🗆 ھو	Barleria prattensis Santapau	Acanthaceae	Undershrub	Endemic to India
_ و و	Caralluma adscendens var. attenuata (Wight) Grav. & Mayur.	Asclepiadaceae	Herb	Endemic to India
] و و	Caralluma truncato <i>-coronata</i> (Sedgw.) Grav. & Mayur.	Asclepiadaceae	Herb	Endemic to Karnataka and Tamil Nadu
_ىو	Commiphora berryi (Arn.) Engl.	Burseraceae	Shrub	Endemic to India
لىو	Crotalaria longipes Wight & Arn.	Fabaceae	Undershrub	Endemic to India
_يو	Dalbergia rubiginosa Roxb.	Fabaceae	Scandent shrub	Endemic to India

Noteworthy species recorded in the Botanical Survey

Noteworthy species recorded in the Botanical Survey

16	Decalepis hamiltonii Wight & Arn.	Asclepiadaceae	Climber	Endemic to India
17.	Deccania pubescens var. candolleana (Wight & Arn.) Tirveng.	Rubiaceae	Shrub	Endemic to Peninsular India
18.	<i>Diospyros neilgerrensis</i> (Wight) Kosterm.	Ebenaceae	Small tree	Endemic to India
19.	Euphorbia corrigioloides Boiss.	Euphorbiaceae	Prostrate herb	Endemic to Peninsular India
20.	Euphorbia elegans Spreng.	Euphorbiaceae	Prostrate herb	Endemic to Peninsular India
21.	Gardenia gummifera L.f.	Rubiaceae	Shrub	Endemic to India
22.	Hardwickia binata Roxb.	Caesalpiniaceae	Tree	Endemic to India
23.	Homonoia retusa (Graham ex Wight) Müll.Arg.	Euphorbiaceae	Shrub	Endemic to India
24.	Indigofera mysorensis DC.	Fabaceae	Herb	Endemic to southern India
25.	Indigofera prostrata Willd.	Fabaceae	Prostrate herb	Endemic to India
26.	Ischaemum nilagiricum Hack.	Poaceae	Herb	Endemic to India
27.	Ixora brachiata Roxb.	Rubiaceae	Shrub	Rare
28.	Jatropha tanjorensis J.L.Ellis & Saroja	Euphorbiaceae	Shrub	Endemic to India
29.	Jatropha villosa Wight	Euphorbiaceae	Undershrub	Endemic to Tamil Nadu
30.	Justicia tranquebariensis L.f.	Acanthaceae	Herb	Endemic to southern India
31.	<i>Leucas hirta</i> (B.Heyne <i>ex</i> Roth) Spreng.	Lamiaceae	Herb	Endemic to India
32.	Memecylon bremeri M.B.Viswan.	Melastomataceae	Small tree	Endemic to Tamil Nadu
33.	Phyllanthus lawii J.Graham	Euphorbiaceae	Shrub	Endemic to India
34.	Phyllanthus wightianus Müll.Arg.	Euphorbiaceae	Shrub	Endemic to Karnataka and Kerala
35.	Pterocarpus marsupium Roxb.	Fabaceae	Tree	Endemic to India
36.	Pterocarpus santalinus L.f.	Fabaceae	Tree	Endemic to India
37.	Pterolobium hexapetalum (Roth) Santapau & Wagh	Caesalpiniaceae	Tree	Endemic to India

Development of virtual herbarium: More than 2000 authentic plant images have been added to the digital collections and more than 5000 herbarium sheets have been digitized and added to the digital inventory.

Outreach and Training: Organised three training programs in herbarium techniques and plant identification for students of Ayurveda from Government Ayurveda College and Sri Sri Ravishankar Ayurveda College, Bengaluru.

Project - 2: Study on development and bottlenecks in production of Pistacia integerrima galls

Extensive field surveys were conducted across the state of Himachal Pradesh. It was also found in sufficient numbers from the districts of Sirmour, Bilaspur and Hamirpur Chamba, Kangra, Shimla and Solan too. The survey showed the species has a disjunctive but wide distribution across the lower regions of Himachal Pradesh, ranging from 400 - 2600 m. However, most populations were in the altitudinal range of 800 – 1600 m, mostly confined to drier open locations and as field bund trees in the sub temperate orchards of stone fruits and other horticultural crops.

Project - 3: Jivanti Welfare and Charitable Trust (JWCT) supported activities at National Herbarium and Raw-Drug Repository of Natural Resources used in Indian System of Medicine at the FRLHT - TDU training program was conducted for Ayurveda students of Bengaluru.

Invited talk:

1. A talk was delivered by Dr. Noorunnisa Begum, at Bio Essence Integrated Healthcare – 11-12 January 2017 at UGC sponsored National Conference by Jyoti Nivas College for more than 500 students on medicinal plants and complexity in identification.

2. A talk was delivered on "Medicinal plants in India and its trade" on 7th February 2017 for 55 B.Sc students

3. Dr. Noorunnisa Begum delivered a lecture on Medicinal plants of Conservation Concern: Quick overview (endemic, red listed and high volume trade) in Training Workshop for senior forest officers on GIS Applications & Working Plan prescriptions for Medicinal plants conservation held on 10-11th February 2017 which was supported by Ministry of Environment, Forests & Climate Change, New Delhi.

4. Dr. Noorunnisa Begum, delivered a talk on "Medicinal Plant diversity of India- Quick Overview" at Training Workshop on Medicinal Plants suitable for MGNREGA Schemes for the officers from MGNREGA held on 19-21st January 2017 and this was supported by Ministry of Environment, Forests & Climate Change, New Delhi.

Publications:

- 1. Tiwari, U.L., **Ravikumar**, **K.**, N. Balachandran and S.K. Sharma. Some new records of plants from the state of Rajasthan, India. *Journal of Threatened Taxa* 8(3): 8632 8637. 2016.
- 2. **Ravikumar, K**., Narasimhan, D., Devanathan, K. and G. Gnanasekaran. *Barleria durairajii* (Acanthaceae): A new species from Tamil Nadu, India. *Rheedea* 26(2): 136–141. 2016.
- 3. Navendu V. Page, Meenakshi Poti and **K. Ravikumar**. *Miliusa flaviviridis* (Annonaceae), a new species from the southern Western Ghats, India. *Phytotaxa* 255 (2): 167–171. 2016.
- 4. Balachandran, N., **K. Ravikumar** and N. Dhatchanamoorthy. New Plant Records to southern India. *Indian Forester* 142 (9): 849-851. 2016.

- Sumanth, M.V., K. Ravikumar, N. Dhatchanamoorthy and T. S. Suma. 2016. Rediscovery of an endemic species, *Impatiens trigonopteris* Hook.f. (Balsaminaceae) from Sikkim Himalaya. *Pleione* 10(2): 388 - 391.
- 6. Balachandran, N., **K. Ravikumar**, K. Rajendiran and W. F. Gastmans (2017): A new species of *Tetrastigma* (Vitaceae) from Tamil Nadu, southern India, *Webbia* DOI:10.1080/00837792.2017.1308110.
- Nandikar, M. D. and Ravikumar, K. 2017. Neotypification and taxonomic reinstatement of *Grewia* macrophylla G. Don (Malvaceae-Grewioideae). *Taiwania* 62(3): 299-304. DOI: 10.6165/tai.2017.62.299.
- 8. Priyanka Mishra, Amit Kumar, Gokul Sivaraman, Ashutosh K. Shukla, **Ravikumar Kaliamoorthy**, Adrian Slater & Sundaresan Velusamy. 2017. Character-based DNA barcoding for authentication and conservation of IUCN Red listed threatened species of genus *Decalepis* (Apocynaceae). Scientific Reports 7: 14910 | DOI:10.1038/s41598-017-14887
- 9. Sebastian Soosairaj, Prakasam Raja, Johny Kumar Tagore and & **Narayanasamy Dhatchanamoorthy.** 2016. Adiantum latifolium (PTERIDACEAE): A New Record to Eastern Ghats from Tamil Nadu, India. ISSN 0970-4183. *Journal of the Andaman Science Association* Vol. 21(2):199-201.
- 10. P. Raja, S. Soosairaj, **N. Dhatchanamoorthy,** Johny Kumar Tagore and A. Kala. 2016. *Scleria tessellata* Willd. (Cyperaceae), A New Record for Tamil Nadu, India. Scientific Publisher, *Journal of Economic and Taxonomy Botany*, Vol. No. 40; Issue 1-2: 1-3pp.
- 11. **Narayanasamy Dhatchanamoorthy** Thangavel Arumugam & Ponnusamy senthil kumar. 2016. Rediscovery of *Crotalaria rigida* (Leguminosae)-Rare and endemic legume of Southern India, Tamil Nadu. ISSN 1179-3163; *Phytotaxa* 278 (3): 297-300.
- 12. **N. Dhatchanamoorthy,** N. Balachandran & M. Ayyanar. 2016. Notes on some rare plant collections from the southern Coromandel Coast, India. ISSN: 454-4787. *South Indian Journal of Biological Sciences* 2(2); 256-263pp.

Team:

Dr. K. Ravikumar, Mr. Brij Bhushan (Taxonomist)- Himalayan Forest Research Institute (HFRI), Himachal Pradesh. Dr. S. Noorunnisa Begum, Mr. A.C. Tangavelou and Dr. N. Dhatchana moorthy Dr. S. Gokul Ms. Preeti Singh



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School of Conservation of Natural Resources



"Study on tradable medicinal bio-resources and developing adaptive management strategy for selected species in Tripura" under the project : "Conservation and Sustainable Use of Medicinal Plants Resources in Tripura – Linking Institutional, Ecological and Economic Management of Resources"

Relevance (scientific/social) of the project: This project helped in understanding the major medicinal plants species which are traded in the Mandis of the state. It helped to assess and understand the trade volume, various routes of trade, price and profit share the local people got from the trade. Economics of collection, processing and value addition of selected species was done during the study. This study also helped to get a backward linkage of the traded species with its resource base. Under this project, the traditional and recent collection practices of select medicinal plants have been documented. The local people got trained about sustainable collection practices. Empowerment of the local medicinal plants collectors helped in better management of the resources and profit share.

Highlights of progress/ achievements: A trade study was conducted among 10 major traders and in two Mandis in the state. A total of 19 medicinal plant species have been documented which were traded in a substantial/sizable quantity.

A training manual on sustainable wild collection of medicinal plants was developed under this project and applied to train the local collectors and the Joint Forest Management Committee (JFMC) members.

Publications/Research papers/ invited talks: The staff of TDU staff were invited to deliver talk at Tripura University and in a workshop conducted by Medicinal Plants Board of Tripura during the year 2016 & 2017.

Team

Mr. D.K. Ved Dr. Debabratha Saha Mr. Abhijit Nama Dr. Abdul Kareem Ms. Sathya Sangeetha Dr. Venugopal S .N Ms. Tabassum Ishrath Fathima Mr. Narayan Prakash



School of Conservation of Natural Resources







Screen shots of Webistes and Mobile App



🙆 💮 FRLHT TU 2002 **ENVIS APP** ão. **NEIGHBOURHOOD** Medicinal Plants Version 0.5.0

Environmental Information Systems (ENVIS) Centre on Medicinal Plants, Supported by Ministry of Environment and Forest & Climate Change (MOEF&CC), Government of India

1. Encyclopedia on Indian Medicinal Plants: There are two ENVIS websites on medicinal plants viz *envis.frlht.org* and *frlhtenvis.nic.in*. The core of this site is a dynamic database on medicinal plants. This serves as a reference point for many researchers, policy makers, traders, industries, academicians and resource managers. It also forms part of various scientific publications.

2. Release of two Mobile Apps on Medicinal Plants

- A. "Indian Medicinal Plants of Conservation Concern Red Listed Med Plants Version 1.0": This app shares information on 335 medicinal plants of conservation concern for India. Designed especially for resource managers, policy makers, researchers, traders, manufacturers to create awareness about the threatened medicinal plants species. The contents of this app are derived from a rigorous process called Conservation Assessment and Management Prioritization process (CAMP) which adopts IUCN Red List Criteria and Categories (Version 3.1), to assign the RED List status. App can be searched through state, habit, scientific name, IUCN threatened categories. This app was released by Shri Ajay Narayan Jha, Secretary, Ministry of Environment, Forest and Climate Change (MoEF&CC) on 17th March 2017 at National Workshop of ENVIS Centres. This App comprises of total 300+ Red List Status species.
- B. Mobile App: Neighborhood Medicinal Plants App –Version 0.5.0 (Bangalore city) with flower colour search.

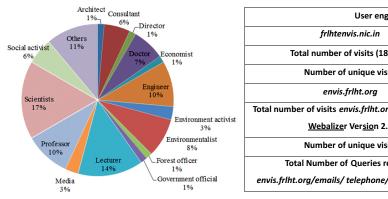
This is specially designed for students and nature lovers, who are interested to learn about their neighborhood plants that are medicinally important. This app is designed for Bengaluru city. Search can be done habit wise (Herb/shrub/tree/climbers) or through flower colour or vernacular and scientific names.

- 3. Digital Atlas on Bhuvan portal: ENVIS team members have facilitated in uploading state level distribution information and maps for 1500 medicinal plants species, developed under CoE project, supported by MoEF & CC's at FRLHT-TDU, Bangalore). Medicinal Plants Conservation Areas (MPCAs), *in-situ* sites where wild gene pools are conserved is now made available on Bhuvan portal, GoI. This is a follow-up action of the training offered to the ENVIS team members. For more information click on the link: Database/Digital_Atlas_2272.aspx108 (Medicinal plants distribution and MPCA on Bhuvan portal).
- Citizen Science initiatives: To popularize medicinal plants and traditional knowledge in Citizen Science forum, yet another step was taken. ENVIS got connected to India Biodiversity Portal (<u>http://indiabiodiversity.org/</u>).
- 5. Enriching ENVIS Plant Profile page in Encyclopedia on Indian Medicinal Plants _with 8 important biodiversity portals such as:
 - GBIF (<u>http://www.gbif.org</u>)
 - Tropicos (<u>http://www.tropicos.org</u>)
 - The plant list (<u>http://www.theplantlist.org</u>)
 - EoL(<u>http://www.eol.org</u>)
 - Wikipedia (<u>https://en.wikipedia.org</u>)
 - Wikimedia (<u>https://commons.wikimedia.org</u>)
 - Wikispecies (<u>https://species.wikimedia.org</u>)
 - India Biodiversity Portal (<u>http://www.indiabiodiversity.org/</u>)

These sites are connected to individual species listed in ENVIS-FRLHT site, thus enriching the plant profile page. To link the site a variety of techniques like use of API or online query mechanism provided by the websites were used. (Biodiversity portals linked to Medicinal Plants profile).

6. ENVIS Users: Diverse target group visit the site for multiple purposes.

The following graph shows the user profile



ENVIS User profile 2016-17

Usage statistics

User engagement and int	eraction
frlhtenvis.nic.in	FY 2016-17
Total number of visits (185442)	69887
Number of unique visits	5986
envis.frlht.org	FY 2016-17
otal number of visits envis.frlht.org Generated by	12451972
Webalizer Ver <u>sio</u> n 2.23	
Number of unique visits	483538
Total Number of Queries received	600 + till date
envis.frlht.org/emails/ telephone/personal visits	

Outreach Activities by ENVIS Centre on Medicinal Plants

Workshop organized by ENVIS Centre on Medicinal Plants, Bengaluru

Date/ Place	Title of seminar/	Focal theme	Host Agency/ Institute
	workshop	covered	
11 th January	Talk on India Bio-	Networking of	ENVIS Centre on Medicinal Plants,
2017	Diversity Portal: A	ENVIS websites	FRLHT-TDU
	way forward	with India	
		Biodiversity Portal	
20 th May 2016	Brainstorming	Activities on ENVIS	ENVIS Centre on Medicinal Plants,
Bengaluru	session for	Centre	FRLHT-TDU, Bengaluru along with
	Southern region		WGBIs ENVIS Centre, CES, IISc,
	ENVIS Centre		Bengaluru and Karnataka ENVIS
			Centre, EMPRI, Bengaluru



Participation in events/ workshops: Team members participated activities in various sharing platforms related to various aspects of medicinal plants diversity, identification, trade, traditional knowledge documentation and conservation concern

Date/ Place	Title of seminar/ workshop	Focal theme covered	Host Agency/ Institute	Who were the participants
28 th -31 st	Lake 2016:	ENVIS Centre activities	Centre for Ecological	School and
December	Conference on	and FRLHT's	Sciences, IISc, Bengaluru	college students
2016	Conservation and	contribution on	and Alva's College and	
Moodabidr	Sustainable	conservation and	Alva's Institute of	
i '	Management of	dissemination of	Engineering and	
	Ecologically	traditional knowledge	Technology, Moodbidiri,	
	Sensitive Regions in Western Ghats		Dakshina Kannada	
20 th - 23 rd	Orientation	Plant morphology,	FRLHT-TDU, Bengaluru	Students from
December	programme on	Anatomy and		Sri Vidya
2016	Plant morphology,	Conservation of		Mandir,
Bengaluru	Anatomy and	Medicinal Plants		Malleshwaram,
	Conservation for			Bengaluru
	students			
9 th -11 th	Conservation	Conservation	Manipur Biodiversity	65 experts and
November	Assessment and	Assessment and	Board, Imphal and	researchers
2016	Management	Management	FRLHT-TDU, Bengaluru	
Imphal	Prioritisation for	Prioritisation for the		
	the Medicinal	Medicinal Plants		
	Plants of Manipur			
25 th	Digitization of	Digitizing 600 medicinal	FRLHT-TDU, Bengaluru	25 students and
October	Medicinal Plants	plant herbarium		researchers
2016	used in Indian	specimens collected at		
Bengaluru	Medical Heritage	FRLH herbaria		
3 rd – 5 th	Conservation	Conservation	Medicinal Plants Board	75 experts and
August	Assessment and	Assessment and	of Tripura, and FRLHT-	researchers
2016	Management	Management	TDU, Bengaluru	
Agartala	Prioritisation for	Prioritisation for the		
	the Medicinal	Medicinal Plants		
	Plants of Tripura	1		



Visit undertaken by team members

Date	Visited place
16 th March 2016	Gujarat Medicinal Plant Board and Herbal Garden

Activities conducted by ENVIS Centre on Medicinal Plants

Date / Place	Activities conducted	Who were the Participants
2 nd to 8 th April 2016 Mysore, Ballari, Wadi	Science Express Climate Action Special 2016	School, college students, public visitors
1 st to 15 th June, 1 st to 15 th November 2016 Bengaluru	Swachh Bharath Pakdwadas	FRLHT-TDU staffs

During 2016-2017, around 507 visitors were oriented towards ENVIS Centre activities at FRLHT-TDU campus.

Publications/Research papers/invited talks related to the activity during the year.

List of publications

Suma Tagadur Sureshchandra, Kalaimoorthy Ravikumar. 2017. Herb collectors are herb mappers. MEDPLANT Newsletter, MoEF & CC, Gol and FRLHT Bengaluru.

Paper presentation

Suma Tagadur Sureshchandra and Kaliamoorthy Ravikumar. 2016. Presentation titled: Experiences from Southern India on Trade of Botanicals. Presented at International Students' Conservation Science Congress, 2016. Organised by IISC. <u>http://www.sccs-bng.org/webpages/student-poster-2016</u>

Team

Mr. DK Ved, Ms. Suma TS, Ms. Suganthi Fathima, Mr. Vijay Srinivas, Mr. Vijay Kumar, Ms. Soumyashree N, Mr. Vasim Kadri, Mr. Tukaram Dokhale.

Advisory Committee

Mr. D.K. Ved IFS Retd., Advisor (Medicinal Plants Expert), Professor. K. Ravikumar, Asst. Director (Expert Plant Taxonomist), Mr. B.S. Somashekhar, Asst. Director (Expert Communication), Mr. P.J. Alexander, Asst. Director (Expert Administrator), Mr. Vijay Barve, Senior Program Officer (Expert GIS & Citizen sciences).

COE project team and Host Institution members, who helped in content addition

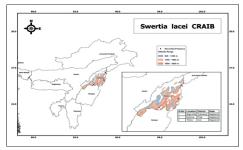
Dr. Venu Gopal SN, Ms. Sathya Sangeetha, Ms. Bhagya Lakshmi; Professor. K. Ravikumar, Dr.Noorunissa Begum, Dr. Ganesh Babu and Ms. Nandini Dholepat, Mr. MA Anatha, Mr. Vinay R, Ms. Tabassum IF, Dr. Shilpa Naveen, Dr. Varghese Thomas, Mr. Naresh K



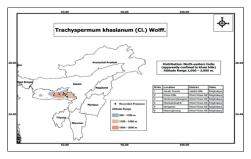
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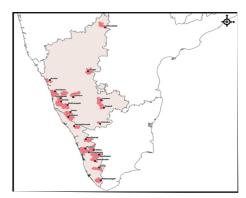
Geographical Distribution Maps for 250 prioritized species: *Garcinia cornea L.*



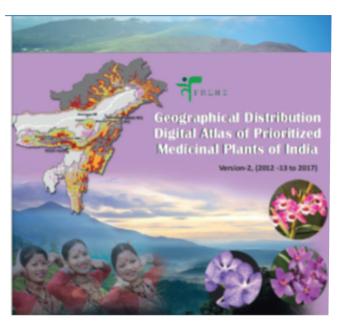
Eco-geographic Map for Swertia lacei CRAIB



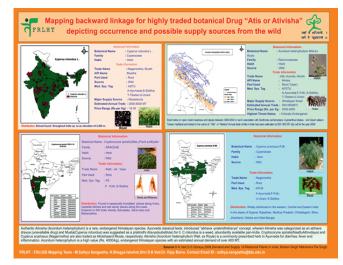
Eco-geographic Map for *Trachyspermum khasianum (Ci.) Wolff.*



Taluka representation of 22 MPCA's across Karnataka & Kerala



CD Cover – "Geographical Distribution Digital Atlas of Prioritized Medicinal Plants of India Version-2"



Poster depicting backward linkages for highly traded botanical Drug "Atis or Ativisha"



Project - 1: Distribution Mapping Using Geographic Information System (GIS) & Mapping Backward Linkages For Traded Species

This task involves two kinds of map generation with distribution information. One is Geographical Distribution maps for prioritized wild medicinal plants using GIS at district level and another is Eco distribution maps. Although there are more than 200 such published floras recording the information about the presence of properly identified species in different states/districts in India, there is hardly any information about the population levels and distribution pattern of many species within a district or state. Keeping these limitations in view, the activity under this component has been focusing on building up a database on the recorded geographical distribution of wild medicinal plant species, based on a thorough review of published literature, supplemented with ground truthing based inputs flowing in from the field surveys of in-house botanical team.

Geographical distribution maps - Datasheets and maps for 250 prioritized wild medicinal plant species that show the wild presence of a species in specific districts of North East India reflecting the compilation from published sources. It aims at providing reliable data on the natural distribution of select medicinal plant species within India, for the use of students, researchers.

Eco distribution maps - 25 prioritized species of conservation concern were prepared using open source GIS (Q GIS) software. These maps incorporate precise geographical locations of occurrence of a medicinal plant species (as latitude and longitude co-ordinates of specimen related records accessed from the herbaria and different publications). Interpreting the correlation between such precise locations and the related ecological parameters (altitude range, rainfall and soil type) provides an understanding of the pattern of natural distribution of a medicinal plant species. This tasks aims to provide reliable information to forest managers, researchers and decision makers.

Digital data were incorporated into 2 volumes of searchable ATLAS of wild Indian medicinal plants (on CD-ROM) - Atlas Volume - 1 incorporates geographical distribution maps for 1920 species with state level presence and detailed Eco distribution maps for 210 species. Atlas Volume – 2 was focused on North East Region which incorporates 1000 geo maps (with state level presence) and 100 Eco-distribution maps generated for prioritized species focusing North East India.

Backward linkage mapping of traded botanicals - Preparation of poster depicting backward linkages with specific regions of occurrence of three plant species used as Atees/Athividayam and its substitute. The team during the year focused on a highly traded botanical drug *Aconitum heterophyllum* and its substitutes namely *Cyperus scariosus, Cyperus rotundus* and *Cryptocoryne spiralis* and completed the necessary literature survey about their wild distribution. These data were used for mapping their backward linkages with possible sources of supply from the wild. Data related to specific sites of presence (herbarium, field records including populations) were compiled and used for developing the maps using QGIS software, depicting the identified regions of occurrence and possible sources of supply. These maps depict the occurrence of wild genetic sources of the species, and help support the conservation action by way of making available, clearer picture about the resource availability, gaps, types of endemism and potential areas for resource augmentation.

Initiating Ecological Niche Modeling (ENM) studies for *Decalepis hamiltonii* which is an endemic as well as highly traded Indian medicinal plant. Two types of data have been used to predict the species distribution i.e. species occurrence data and the environmental data. Species occurrence data are of two types, primary data collected from species locality i.e. latitude and longitude co-ordinates and secondary data sourced from herbaria and published literature (monographs and floras). Environmental data – Interpolated raster data on temperature, precipitation & bioclimatic variables of 19 such are sourced from WORLDCLIM. Both the species occurrence data and the environmental data have been the basic input layers for the Maxent tool to correlate and predict the species distribution. The study is expected to continue by undertaking more field work to add primary data collection and build the model through an iterative process.

Invited talks related to the activity during the year

GIS mapping activity was undertaken under COE from 2002-2016 focused on mapping more than 2000 medicinal plants distribution at state level and around 300 detailed Eco geographic maps for species of conservation concern. As a result of this a **special grant was sanctioned by the steering committee** Centre of Excellence to disseminate the knowledge on medicinal plant distribution and mapping methods to the State Forest Department.

GIS team members were involved as resource persons for imparting the GIS Mapping methods for specific medicinal plants in the "*Training Workshop for Senior Forest Officers on GIS Applications & Working Plan prescriptions for Medicinal plants conservation*" organized by FRLHT-TDU, under MoEF & CC, at Ramanashree California Resorts, Bengaluru during 10-11, February 2017.

Project - 2: Infosys Corpus supported project

Activity

(a) Ecological Niche Modelling Map of Saraca asoca

Developed a first cut Ecological Niche Modelling Map of *Saraca asoca* (an endangered and endemic medicinal plant of Karnataka)using the locations data culled from available literature, Herbarium and field samples of Western Ghats to predict the potential zone of occurrence in North-east India using Maxent software.

(b) Initiation of a "Geospatial Database" for wild medicinal plants of India

Taluka level Geospatial Database of Medicinal plants of Karnataka & Kerala generated using the documented floristic diversity across 22 Talukas in Medicinal Plants Conservation Areas (MPCA's) of Karnataka (960 species) and Kerala (831 species).

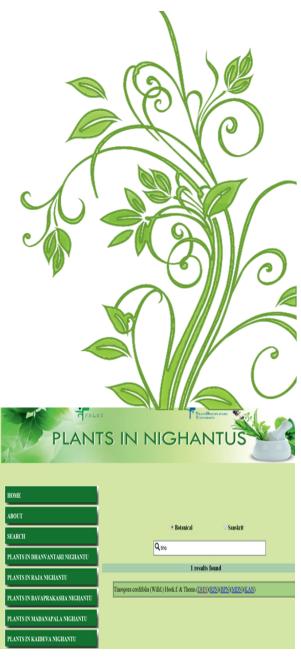
Team

Mr. D.K. Ved Ms. Sathya Sangeetha Ms. Bhagya Lakshmi





Website on medicinal and Aromatic Plants



Project 1: Computerized database & website on Medicinal and Aromatic Plants of Tripura

North East India is one of the richest reservoirs of plant diversity in India and one of the biodiversity hotspots of the world. TDU Informatics team with support from State Forest Department and State medicinal plant board of Tripura initiated the development of an electronic database on medicinal plants of Tripura.

A consultative meeting was held on 23rd April 2016 at Aranya Bhavan, office of Principal Chief Conservator of Forest (PCCF) and the feedback was recorded after demonstrating the prototype version of the website on Medicinal Plants of Tripura.

TDU- Informatics team has endeavored to catalogue the plant entities recorded in medicinal use in the codified systems of Indian medicine namely Ayurveda, Siddha, Unani, Swa-rigpa (Tibetan) and Homoeopathy as well as the ones documented in medicinal use in the folk practices, from the flora and other publications of Tripura. Multi-dimensional data relating to diverse aspects (nomenclature correlation, distribution, trade etc.) were recorded with references. The database has 892 medicinal plants.

A user-friendly interface has been developed for querying the database and to facilitate the viewing of results/outputs with the help of suitable programming inputs. In order to facilitate identification of plant entities, digital images of several medicinal plants have been incorporated in the database.

A function was organized at the Aranya Bhavan at Tripura, in connection with the release of the website on Medicinal Plants of Tripura on 25/04/2017. Minister of Forest Tripura and VC of TDU attended this function and a large gathering of forest officers and CEO of Forest and Medicinal plants board were present during this function.

Project 2: Literature survey reports

Activity 1: Preparation of a document on properties and healing powers of plants, recorded in Traditional knowledge, for *Sandhighatavata* (Osteoarthritis)

An educated and curious public – particularly those having the inclination and capacity to research things from the Internet are in search of herbs that have medicinal properties. Some others are willing to try formulations if each of the ingredients is explained and the basis for claims relating to those ingredients has some foundation.

This exercise was carried out for one disease condition (Osteoarthritis) with data pertaining to 36 medicinal plants (some were repeated) and the segments included were home remedies, single herbs and herbal supplements, classical Ayurvedic medicine and patent & proprietary (P&P) Ayurvedic medicine. Each plant was described with its Clinical / Pharmacological actions described with references; compounds identified with potential effects in arthritis, commonly used dose/formulation, how to use, adverse effects, precautions and photographs of the herb.

Activity 2: Preparation of a document on use of Medicinal plants for enhancing properties of drinking water based on classical Ayurvedic references

The team worked on preparation of a document on use of Medicinal plants for enhancing properties of drinking water. Data for approximately 90 plants were listed with regard to their botanical name, habit, geographical distribution, part used, properties and therapeutic usage. The promotion of these simple recommendations would contribute to wellness and public health.

Project 3: Web module on Plants in Nighantus (lexicons medicinal plants) of Ayurveda

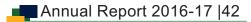
Knowledge of *Nighantus* is one of the integral qualities of a learned physician.

The Center was involved in developing a database of selected *Nighantus* so to help improve the current understanding on Traditional Knowledge on medicinal plants. The synonyms of plants documented in Nighantus which are explaining about morphological characters are useful for plant identification. The data pertaining to pharmacological profile of plants is an essential supportive tool for clinical applications.

The development of a database of Nighantus is a continuous process at the Center. This has resulted in developing distinct modules on medicinal plants mentioned in following Nighantus

- 1) Dhanwantari Nighantu (10th BCE)
- 2) Madanapala Nighantu (13th BCE)
- 3) Kaideva Nighantu (14th BCE)
- 4) Bhavaprakasa Nighantu (15th BCE)
- 5) Raja Nighantu (17th BCE)

A Common software platform with search facilities has been developed during the year. It is possible to browse by plants (botanical name or Sanskrit name or its synonyms) across the above mentioned Nighantus. The interface is linked with Plant images and Sanskrit sloka references of Medicinal plants of around 900 species.



Project 4: Plants in Susruta Samhita, Web module (Beta version)

Web portal on Centre of excellence on medicinal plants and traditional knowledge: <u>www.indianmedicinalplants.in</u>

This facility is aimed at serving the diverse information needs of different use groups, including the students of Indian Systems of Medicine and researchers of ethnomedicine. The wealth of information pertaining to the properties and uses of plants mentioned in classical Ayurvedic texts illustrates the depth of knowledge and its usefulness. *Susruta Samhita* is the work of Acharya *Susruta* (one of the Brihat-trayees of Ayurveda during 1500 BC-400 AD) which provides in-depth knowledge of the plants.

This web module brings together comprehensive information of 775 plant drugs which are correlated to 1078 distinct botanical names including the synonyms. The information is supported by 9676 citations from the text, which correspond to 1856 distinct Sanskrit names, of which identity of 119 has not been established. This facility also offers detailed clinical data including the descriptive plant information for 528 species along with about 1300 plant images.

Publications/Research papers/invited talks related to the activity during the year

- S.N.Venugopalan Nair, Venkatasubramanian P, Understanding the concept-Rasayana in Ayurveda Biology, Journal of Natural & Ayurvedic Medicine, Medwin publishers, Vol1.Issue 2. (2017).
- 2. S.N.Venugopalan Nair, Darshan Shankar, Knowledge generation in Ayurveda: Methodological aspects, Indian Journal of History of Science, 51.1 (2016) 48-55.
- Fathima I.T., Nair.S.N.V., and Somashekar.R.K., 2017. Traditional Knowledge in policy and practice: An Approach to development and human well-being, International conference of Science and Technology for Management of Emerging Environmental Issues, January 7th, ISBN 978-81-921562-3.1

Team:

Dr. Alwar M A Vidvan Anantha, M A Shri. Darshan Shankar Dr. Gopikrishna Dr. Hemanth Dr. Shilpa Naveen Ms. Tabassum Ishrath Fathima Prof. Thattachar Dr. Varghese Thomas Mr. Ved, D K Dr. Venugopalan Nair



School of Conservation of Natural Resources



Documentaiton of List of Collectors in Agrahara JFMC Bellary, Karnataka



Community participation in Augmentation work in Panchavati JFMC

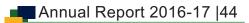


Classroom session on sustainable harvesting techniques at Bobli-Hinchuvalli, Shivamogga Forest Division, Karnataka





Photo 9 Soil Sampling at Rachammana Bana, Karnataka



Develop Innovative tools, Techniques, and Methods to improve the harvesting of several important forest NTFPs in Shimoga District, Karnataka. Project is funded by USAID, under Forest PLUS Programme in India.

Relevance of the project:

The project aims at development of sustainable harvesting tools and techniques for 3 species viz., *Ailanthus triphysa, Cinnamomum malabatrum* and *Sapindus emarginatus* and field implementation at 4 Village Forest Committees (VFCs) viz., Kikkeri in Shivamogga Forest Division and Aramanekoppa, Maruthipura and Sulugodu in Sagara Forest Division, Karnataka. In this project providing economic incentives to the Non Timber Forest Product (NTFP) collectors for the sustainably harvested medicinal produces by linking the market was also attempted.

Highlights of progress/achievements:

- During 2016-17, sustainable harvesting of Sapindus (soap nut) fruits was organized that fetched Rs. 14/ kg of fruits as against market rate of Rs. 6/ kg. This price appreciation was due to implementation of sustainable harvesting techniques.
- The concept and importance of sustainable harvesting of NTFPs was spread to other VFCs in Shivamogga district through community training and awareness programs, communication materials and street plays. Table 1 provides list of community trainings organized during 2016-17.

SI.	Name of the VFC	Forest Range and Division	Date of	No. of
No.			training	trainees
			program	
1.	Bobli-Hinchuvalli	Thirthahalli, Shivamogga	30.05.2016	22
2.	Beesu	Thirthahalli, Shivamogga	30.05.2016	14
3.	Kilanduru	Nagara, Sagara	30.05.2016	20
4.	Mudugoppa	Nagara, Sagara	30.05.2016	19
5.	Kaarakki	Hosanagara, Sagara	31.05.2016	42
6.	Mulugudde	Hosanagara, Sagara	31.05.2016	20

Details of community training programmes

Publications under this project:

- 1. Final report on "Community-level communication campaign for increasing awareness of the ecosystem approach to forest management", ITD-HST and Tetra Tech ARD, May 2016, 18 pages.
- 2. Final report on "Community-level training program for harvesters in sustainable NTFP harvesting methods", ITD-HST and Tetra Tech ARD, May 2016, 50 pages.
- 3. Final report on "The results of quantitative monitoring of the effects of NTFP sustainable harvesting practices through at least one harvesting season", ITD-HST and Tetra Tech ARD, November 2016, 25 pages.

- 4. Final report on "Technical support to harvesters to implement NTFP sustainable harvesting methods", ITD-HST and Tetra Tech ARD, May 2016, 33 pages.
- "Final plan document, describes a plan to transition of the sustainable harvesting activities to a long-term program of the ITD-HST before Forest-PLUS ends in 2017", ITD-HST and Tetra Tech ARD, February 2017, 19 pages.

Invited lectures:

Jagannatha Rao R. delivered a special lecture on "Sustainable Forest Management (SFM) and Ecosystem Based Forest Management (EAFM)" at Shivamogga during orientation program for forest officers of Chikkamagaluru, Shivamogga and Canara Forest Circles, Karnataka on 16th February 2017 organised by Forest PLUS, India and Karnataka Forest Department.

Project 1: Generation of Livelihood Opportunities for the Local Communities in Savanadurga by Sustainably Utilising the Natural Resources, Funded by National Medicinal Plants Board (NMPB) through Karnataka Forest Department.

Relevance:

This project aims at providing market linkages to the sustainably harvested medicinal plants from the wild to economically benefit the medicinal plants collectors and the Joint Forest Management Committees (JFMCs). These JFMCs are the fringe villages around Savanadurga Medicinal Plants Conservation Area (MPCA) so that the local community is involved in long term conservation activities. This project also provides financial assistance for development of infrastructure facilities at the JFMCs such as storage godown, drying yard and value addition equipment.

Highlights of the progress:

- Identified collectors from 4 JFMCs viz., Dabbaguli, K.V. Matha, Nayakana Palya and Polohalli in Magadi forest range of Ramanagara District, Karnataka and provided identity cards to them. This card is signed by Range Forest Officer, Deputy Range Forest Officer who is also Member Secretary to the JFMC and President of the JFMC which acts as a permit for wild collection.
- Field implemented the sustainable harvesting techniques for leaves of *Gymnema sylvestre*, which is used in diabetic control formulations and fruits of *Tamarindus indica* (Tamarind) in 4 JFMCs.
- Marketing of sustainably collected leaves of *Gymnema sylvestre* and fruits of Tamarind was organized. The collectors received Rs. 70/ kg of dry leaves of Gymnema sylvestre as against market price of Rs. 50/ kg of dry leaves due to following sustainable harvesting techniques. Rs. 20/kg of unprocessed tamarind was given to the collectors, where as the market rate is only Rs. 4-6.
- A training-cum-demonstration of tamarind fruit dehuller and deseeder was organized with the support from Gandhi Krishi Vigyan Kendra (GKVK), Bengaluru on 9th February 2017. 50 JFMC members had attended this program.
- Two Buyer-Sellers' meets were organised in collaboration with Karnataka Medicinal Plants Authority (KaMPA) on 24th June 2016 and 10th September 2016. Fifty five herbal industries had participated and showed interest in purchasing the medicinal plant produces from the project JFMCs.
- Training-cum-exposure visit to Kerala Forest Research Institute (KFRI), Nilabur, Kerala from 20th 23rd December 2016 was organized for 15 JFMC members to understand value addition, marketing and resource augmentation of medicinal plant produces

Publications:

Deepa GB, Rajashree GM and Jagannatha Rao R. 2016. ಕರ್ನಾಟಕದಲ್ಲಿ ವಿನಾಶದ ಅಂಚಿನಲ್ಲಿರುವ ಮತ್ತು ಅತಿ ಹೆಚ್ಚು ಮಾರಾಟವಾಗುವ ಔಷಧಿ ಸಸ್ಯಗಳ ಸಂರಕ್ಷಣೆ, ಸುಸ್ಥಿರ ಸಂಗ್ರಹಣೆ ಮತ್ತು ಮೌಲ್ಯವರ್ಧನೆ (Conservation, Sustainable Harvesting and Value addition of Threatened and High Traded Medicinal Plants of Karnataka). KFRI, Nilambur.

Invited Lectures:

- 1. Deepa GB delivered an invited lecture on "Nursery and propagation techniques of selected medicinal plant species" at Kerala Forest Research Institute, Nilambur during training-cumexposure visit of 22 JFMCs on 21st December 2016.
- Jagannatha Rao R. delivered key note address on "Value addition and Marketing of NTFPs/ Medicinal Plants" at International Herbal Fair, Bhopal, 2016 organised by Madhya Pradesh State Minor Forest Produces (Trade & Development) Cooperative Federation Ltd., on 22nd December 2016.
- Jagannatha Rao R. delivered key note address on "Conservation, Sustainable Harvesting and Value addition of Threatened and High Traded Medicinal Plants of Karnataka" at Kerala Forest Research Institute, Nilambur during training-cum-exposure visit of 22 JFMCs on 9th December 2016, 20th December 2016 and 10th January 2017.

Project 2: Sustainable harvesting, value addition, warehousing and marketing of selected RET & high traded species in Peechi and Silent Valley Wildlife Divisions, Kerala (JFMC/KE-01 & 02/2016) Funded by National Medicinal Plants Board (NMPB) through Kerala Forest and Wildlife Department.

Relevance of the project:

This project is aimed to implement the good collection practices of medicinal plants especially conservation concern species collected from nine Eco-Development Committee (EDC) areas through regular training and capacity building activities targeting the tribal local collectors in Peechi Wildlife Sanctuary and Silent Valley National Park. Besides, in this project, collectors are provided support to perform value additions locally, and are also given market linkage to trade their collections for a good price. In this project, the TDU offers technical support to implementing agency i.e. Kerala Forests and Wildlife Department.

Highlights of progress/ achievements:

Following were the achievements made in this project during the period (2016-17)

- The baseline data of medicinal plants collected and their quality, marketing, etc. from nine EDCs was documented. Traditional collection methods were also recorded
- In order to develop sustainable collection practices, out of more than 50 medicinal plants that are under collection in nine EDCs, 14 species were prioritised
- The Good Collection Practices (GCPs) for 14 selected species were prepared and translated into Malayalam language for circulation among collectors
- A team of 10 to 15 members, called Task team, was formed in each EDC to implement GCPs for wild collection
- The details of collectors were documented in each EDC and collectors were given identity cards
- Training & capacity building programmes on implementing GCPs in the field were periodically
 organized for local collectors, local community institutions, and front line staff of Forest
 Department
- Communication materials such as posters and fact sheets related to GCPs for medicinal plants were prepared in this project

Project 3: All India Coordinated Research Project on Sacred Grove ecosystem service assessment Evaluation of ecosystem services provided by sacred groves in selected locations in Kerala and Karnataka (NO. 22/17/2011 – SG/RE), Funded by Ministry of Environment, Forest and Climate Change (MoEFCC).

Relevance of the project:

Sacred groves are islands of biodiversity that are preserved undisturbed and in a pristine way due to religious reasons. This relic vegetation offers refuge to several rare and threatened flora and fauna besides offering a host of services to humanity. This project attempted to document and also to quantify six ecosystem services provided by four sacred groves sites in Kerala viz., Irangol Kavu in Ernakulam Kulathur Kottara Kavu in Thrissur, Kottarapurathu Kalari Kavu in Kollam and Parakattu Kavu in Palakkad; and 4 sites in Karnataka viz., Kaveriammana Bana in Kodagu, Rachammana Bana in Shivamogga, Mattigar Chowdammana Bana and Kalyanapura Bana in Uttara Kannada by implementing the methodology developed by All India Coordinated project with 15 partners across India.

Highlights of progress/ achievements:

Following were the achievements made in this project

- The final checklist of plant species was prepared for Kerala and Karnataka with data collected using quantitative and qualitative inventory studies. In Kerala 176 species and in Karnataka 316 species have been documented.
- The documentation of natural regeneration within sacred groves was undertaken during field visits using quadrat method. The threatened species such as *Saraca asoca*, *Syzygium travancoricum*, *Vateria indica*, *Hydnocarpus pentandrus*, etc. were reported to have good regeneration within sacred groves.
- Water resource monitoring of sacred groves revealed that the perennial nature of water bodies play an important role in maintaining water balance through ground water recharging in surrounding areas.
- The soil nutrient status of sacred groves indicates that they are rich in NPK and other micronutrients in comparison with soil samples taken outside sacred grove sites. The rich vegetation in these areas is attributed to the rich soil nutrients.
- The record of calendar events of spiritual activity and festivals in each sacred grove was regularly updated and maintained. This indicated that the spiritual and cultural practices are still intact in the sacred groves.
- This study revealed that sacred grove as a natural ecosystem is not just the refugium of cultural and traditional heritage wisdom and local actions, but also harbours good number of flora and fauna, besides offering other services including water, pollination, nutrient cycling, etc.



Project 4: Sustainable Harvesting, Value Addition, Warehousing and Marketing of Selected RET and High Traded Medicinal Plant Species Covering 22 JFMCs in 18 Forest Divisions of Karnataka, India Department, Funded by National Medicinal Plants Board (NMPB), Govt. of India through Karnataka Forest Department (September 2014 – March 2019)

Relevance:

This Project sponsored by National Medicinal Plants Board (NMPB) implemented in Karnataka in collaboration with Karnataka Forest Department (KFD) supports basic infrastructure facilities like storage godown, drying yard, equipment and revolving fund to improve the quality of raw drugs supplied to the herbal industries through community participation by promoting Good Collection practices. Further, it supports to ensure fair price for the semi-processed produce and generate an additional income and employment through market linkage at Joint Forest Management Committee (JFMC) level with the technical support of TDU.

Highlights of Progress:

- Training Programmes were organized at respective JFMC to collectors and task team members on "Sustainable Collection, Value Addition" of selected species and Distribution of ID cards in Hasirumane (20 collectors), Augmbe (33) and Illemane (35) JFMC respectively on 19th, 20th and 21st May 2016 for identified collectors in the area
- Training programme organized at respective JFMC on "Sustainable collection, Value addition, Storage, Marketing of selected Medicinal Plants in Banadur (37 participants), Balagonda (50 participants), N. R. Pura (44 participants) and Koppa (53 participants), Honnasgadde (55 participants) JFMC on 13th July 2016, 20th July 2016, 8th 9th and 11th November 2016 respectively
- Monitored the Collection of:
 - *Garcinia-gummigutta* in Agumbe, Illemane and Hasiurmane VFC of Shivamogga Forest Division where they practiced Good Collection Practices also followed the Scientific method of fuel efficient Tray drying
 - Azadirachta indica in Agrahara VFC of Raichur Forest Division
 - Tamarindus indica in Jodukatte VFC of Ramanagara Forest Division
 - Terminalia chebula in Badenahalli VFC of Forest Tumkur Divison
 - Buyer-sellers interactive meeting on providing market linkage to sustainably collected raw drugs were organized in collaboration with KFD and KaMPA on 24th June 2016, 10th September 2016, 6th March 2017, where 150-200 participants from Herbal Industry, Forest Department and VFC members participated during each of the meet

Publications/Research Papers/invited talks relate to activity

Good Collection and Value Addition Practices for 19 species of conservation concern and high traded in Karnataka (English and Kannada).

Invited Talk

- Mr. Jagannatha Rao R. delivered a special talk on "Sustainable harvesting, value addition, storage and market linkages for selected medicinal plant species of Karnataka" during Buyer-Sellers' meet organized by KaMPA, held at Aranya Bhavan, Malleshwaram, Bengaluru on 24th June 2016.
- Jagannatha Rao R. delivered plenary lecture on "Conservation, Sustainable Harvesting and Value addition of Threatened and High Traded Medicinal Plants of Karnataka" at Kerala Forest Research Institute, Nilambur during training-cum-exposure visit of 22 JFMCs on 9th December 2016 and 10th January 2017.

Project 5: Resource Augmentation of selected RET and High Traded Medicinal Plant species Covering 22 JFMCs in 18 Forest Divisions of Karnataka, India; Funded by National Medicinal Plants Board (NMPB), Govt. of India through Karnataka Forest Department (September 2014 – March 2019)

Relevance:

This project sponsored by National Medicinal Plants Board (NMPB) implemented in Karnataka in collaboration with Karnataka Forest Department (KFD) supports for Plantation including maintenance, soil-moisture conservation, Awareness programmes, micro-planning, fencing, monitoring and evaluation and entry point activities to conserve selected species in 22 JFMCs selected for the project implementation through developing resource augmentation models such as Artificial Regeneration (AR) and Aided Natural Regeneration (ANR). This helps in conservation and restoration of Gene pool of selected Medicinal plants. It contributes for Raw material security of selected medicinal plants to AYUSH industries Project is being implemented by Karnataka Forest Department with technical support is provided by TDU.

Highlights of Progress:

- Training program on Nursery, propagation, resources augmentation and plantation techniques of selected medicinal plants in Banadur (37 participants), Balagonda (50 participants), N. R. Pura (44 participants) and Koppa (53 participants), Honnasgadde (55 participants) VFC on 13th July 2016, 20th July 2016, 8th 9th and 11th November 2016 respectively
- Training-cum-Exposure visit to 114 participants (5 members from each of 22 JFMCs including Frontline staff of forest department)at Kerala Forest Research Institute, Nilambur on conservation and sustainable use of medicinal plants in 3 batches from 21st to 23rd November 2016, 6th to 9th December 2016 and 9th to 13th January 2017

Publications relate to activity

Guidelines on Nursery and Propagation techniques for 19 species of conservation concern and high traded in Karnataka (English and Kannada).

Invited talks

Invited lecture on Nursery and Propagation techniques of Medicinal plants at KFRI Nilambur on 12th Janurary 2017, presented by Mrs. Rajashree G. Mavinkurve, Assistant Professor

Academic activities

Proposed for MSc Programme on Herbal Quality Assurance and Regulatory Affairs which was approved by Board of Studies and Academic and Research Council

Team :

- Mr. Jagannatha Rao R
- Ms. Rajashree G. Mavinkurve
- Ms. Deepa G. B
- Dr. Arthur Selwyn Mark
- Mr. A.K. Pramod
- Dr. Sreekala Pramod



School of Conservation of Natural Resources



Campus of NACIN was landscaped Shriram Panorama Hills is a township at Visakapatnam, Andhra aesthetically with medicinal plants . This Pradesh, where the entire township is landscaped using garden was inaugurated by Honorable medicinal plants by our center. Minister of Finance Shri. Arun Jaitley and he planted a Rudraksh tree.

Centre for Herbal Gardens

Centre for Herbal Gardens (CHG) is working with the vision of creating healing gardens throughout India to achieve self-reliance in Primary Health Care for human as well as livestock. CHG has created Ethno Medicinal Garden with over 1500 species of medicinal plants to familiarize the native source of flora to the communities and practical use of these herbs. This Ethno Medicinal Garden is a unique garden that has been aesthetically landscaped, exclusively with native medicinal plants. It is a live repository of medicinal plants, collected from all over India that can be grown in the climatic conditions of Bengaluru. One can find 45 theme-based demonstration plots in the garden by using the plants belong to all habits, ranging from herbs, shrubs, climbers and trees. Attractive signages accompany each plant to inform the visitors about the ethno-botany of each plant. There are special signages for some plant species that are host to specific butterflies. Our visitors include students, doctors, folk healers, traders, housewives and researchers. Part of the Garden is the organic, outreach nursery, which has over 500 species of medicinal plants that distributes medicinal plants to the various communities.

Training programmes, practical workshops, garden trails are conducted regularly in designing herbal gardens, taxonomic identification of plants, propagation techniques, utilization of medicinal plants for primary health care, herbarium techniques and sharing our knowledge. Other outreach activities include promotion and implementation programmes for creation of I-AIM Home Garden and I-AIM Institutional Garden in India; participation in exhibitions, flower shows, melas etc., to popularize medicinal plants and spread the message "Grow plants for better health". CHG is the pioneer in landscaping gardens with native medicinal plants. We have established many herbal gardens throughout India. The following are the few examples.

Project 1: Collection of seeds of Red Listed Medicinal plants for germ plasm conservation sponsored by Botanic Gardens Conservation International (BGCI), UK.

Under this project, we have conducted 10 botanical surveys in Western Ghats, Eastern Ghats and Deccan Hill locks including Palni Hills and collected seeds from 32 Red Listed Medicinal Plants. The plant species are *Embelia ribes, Celastrus paniculatus, Oroxylum indicum, Operculina turpethum, Decalepis hamiltonii, Rauvolfia serpentina*, and *Erinocarpus nimmonii*, a species appeared on the Red Data book of Indian Medicinal Plants.

Project 2: Shriram Panorama Hills is a township at Visakapatnam, Andhra Pradesh, where the entire township is landscaped using medicinal plants by our center. This project was funded by Shriram properties/Global Entropolis, Vizag. Interestingly, this township is visited by schools and college students to know about the local medicinal plants that can be used for the primary health care and also to study about the associated butterflies, bees and birds.

Project 3: Development of Green Belt of 30 acres with Red Listed medicinal plants sponsored by Jindal Steel Works Limited, Vidyanagar, Bellary. This project is a 4-year project that involves land development work to post-care operations after planting. During 2016-17, around 10,000 numbers of Red Listed medicinal trees, shrubs, climbers and herbs have been planted and nurtured. The important plants species are *Canarium strictum, Vateria indica, Santalum albam, Pterocarpus santalinus, Saraca asoka, Janakia arayalapathra, Utleria salicifolia, Acorus calamus, and Keamfperia galanga.*

Project 4: Landscaping campus with medicinal plants for National Academy for Customs, Indirect Taxes and Narcotics (NACIN), Bengaluru. Under this project, the whole 3-acre campus of NACIN was landscaped aesthetically with medicinal plants. This garden was inaugurated by Honorable Minister of Finance Shri. Arun Jaitley and he planted a Rudraksh tree.

Project 5: Empowering rural women through establishing 'Women Technology Park" (WTP) sponsored by Department of Science and Technology, Govt. of India. Under this project, during 2016-17, 200 rural women were trained on the various capacities of entrepreneurship. These women were trained under the following titles

- Establishing and maintaining Home Herbal Gardens for Primary Health Care,
- Establish Vermicomposting units and its marketing linkages and
- Creation and maintenance of Medicinal plant Nursery.

Internship

SI. No.	Name of the student	Course	College/Institute	Topic of the project
1.	Indu Arunan	BSc	St. Joseph's College, Bengaluru	Morphology ofplants and landscaping
2.	Ankita	MSc	Indraprasta University, New Delhi	Indoor plants for landscaping

Publications

- 1. Angayalli Arogya: Kannada- User's guide for home herbal gardens
- 2. I Love my healing garden: English- User's guide for home herbal gardens
- 3. Erehulu gobbara thatarike: Kannada- Vermicompost technology
- 4. Manpuzhu ura urpatthi :Tamil- Vermicompost technology
- 5. Punaruthpadane mattu nursery thanthrajnana: Kannada- Nursery and propagation techniques.
- 6. Herbal Gardening Heals: English- User's guide for Horticulture therapy
- 7. Nursery and propagation techniques: English

Team:

- Dr. Ganesh Babu
- Mr. Hanumanthrayappa
- Ms. Revathi
- Ms. Nandinin D
- Mr. Umesh
- Mr. Manjunath
- Mr. Maruthi



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Women SHG members undergoing training programs in vermicomposting, nursery & propagation techniques and home herbal garden for primary health care.



TamRas Team with Partners & Mentors

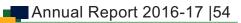


Vermicomposting units established by women entrepreneurs





Copper Device in a can



Developing and testing of self-sustaining model(s) for the supply and use of a low-cost purification device for safe drinking water

Brief background

Scientists at FRLHT-TDU, led by Dr. Padma Venkat, demonstrated that storing drinking water in copper pots killed diarrheagenic pathogens. A cost-effective device was designed, which was as effective as the copper pots in killing pathogens. Through a Grand Challenges Canada grant, the team successfully demonstrated the effectiveness of the device in field settings, in Indian and Kenyan households. Funds received in the current year from the Tata Trusts were utilized to productise the device and develop a self-sustainable business model for outreach.

Program/Activity description

There were three major components in this project: Science & Technology component; Business component and Social component. The execution of the project required establishing partnerships with organisations with expertise in various disciplines including design, testing, manufacturing, production, communication and social action. Agreements were signed with Selco Foundation, Srishti School of Arts & Design, Yuj Designs and BML Manufacturing and social action Community Based Organizations (CBOs) were identified. Agreements were signed with Jenugoodu (MM Hills), Swami Vivekananda Youth Movement (SVYM, HD Kote) and Samuha (Raichur) for implementation of social component related activities.

Highlights of the progress/ achievements

Following were the major achievements of the project

- Laboratory based experiments were done to evaluate new designs of the copper coil for contact time reduction and effect of turbidity
- Effect of the device was tested against WHO surrogate bacterial and viral strains. Bacteriophage culture technique was established at FRLHT-TDU facility
- Two workshops were conducted: (i) The project convergence workshop and (ii) The communication strategy. The 2-day project convergence workshop held in November 2016, in Bangalore helped bring together the partners and potential partners and share the work progress and discuss ways of working together to meet project objectives. The 2-day communication strategy workshop held in Feb 2017 at SVYM, Mysore with the NGO partners and creative agency discussed and shortlisted the communication formats, materials, branding and logo options.
- Received almost 20-25 different design concepts for the copper unit from the design partners. All the prototypes developed were tested for aesthetics, compliance (anti-microbial, copper levels), convenience and cost (ACCC)
- Study protocol was developed to implement the project and the study was registered under CTRI-India (CTRI/2017/02/007947)
- Baseline survey questionnaire was developed to understand the profiles of the communities better and their WASH (water, sanitation and hygiene) and drinking water related Knowledge, Attitude, Practice (KAP) and field tested in selected villages of 3 taluka in Karnataka (HD Kote, Kollegala, Raichur)
- Android based tablet applications were developed by Foundation for Research in Health Sciences (FRHS) to capture and compile the data from three different sites
- Training manuals were developed and the 3 NGO partners (Jenugudu, SVYM, Samuha) and Village

Resource Persons (VRPs) were oriented and trained in the purpose and method of surveys, including in the use of the mobile App

- Baseline survey of ~1500 households, Focus Group Discussions and In-Depth interviews were conducted
- Data analysis was completed and baseline survey report has been prepared
- A communication strategy document has been developed to make messages pertaining to WASH, SWDP and copper product usage sustainable among the communities beyond the project period
- Business models (including social enterprise model and others) and break up of cost of the product have been worked out
- To begin with a hub & spokes model has been agreed to by all partners of the project to be tested out

Workshops

- Project convergence workshop conducted by FRLHT-TDU on 29-30 Nov 2016, at Bangalore
- Communication workshop conducted by FRLHT-TDU on 20 Feb 2017 at SVYM, Mysore

Invited Speaker/Participation for the workshop

- Delivered a two hour lecture on 'Trans-disciplinary research approach to handle public health issues' to TDU PhD students as an orientation for integrating several disciplines for solving a real life problem such as unsafe drinking water
- A collaborative proposal on 'Annual School for Grass root Innovations' was submitted by National Institute of Advance Studies (NIAS), TDU and others to DST. Discussions and inputs to the presentation that was made to DST
- Participated in GAP (Global Action against Poverty) Change Makers conference organized by Head Held High in February 2017 at Christ University, Bangalore. Discussed with NGOs and other experts on the potential of including copper product in the repertoire of social enterprises
- Presentation on the copper work at the project convergence workshop and communication workshop

Team members involved

TDU

Dr. Padma Venkat Mr. Harirammurthi G Dr. B N Prakash Dr. Sarin N S Ms. Sheeba Ganeshan Ms. Lali B Dr. Santhosh Dr. Shivanand S Dr Ashwini Godbole Mr. Samson Ms. Veda Nandish Ms. Monica Mr. Eswarappa Mr. Kumaraswamy

Consultants

Ms. Meetu Desai Mr. Venkatachari Prof. P S Sundar Rao Ms. Florence Mr. Rajeev Menon

Project Advisors

Mr. Madan Padaki, CEO, 1 Bridge, Bangalore Mr. Manoj Kumar, Advisor Tata Trusts; CEO, FISE, Bangalore Dr. Nirmala Murthy, FRHS, Bangalore



Comparative phytochemical and pharmacology studies of medicinal plant substitute for *Meda* and *Mahameda* - Two endangered *Ashtavarga* drugs of Ayurveda

Relevance (scientific/social) of the project: Ayurveda acclaims a group of eight plant drugs (*Ashtavarga, viz., Jivaka, Rsabhaka, Meda-Mahameda, Kakoli, Ksirakakoli,* and *Rddhi-Vrddhi*) as excellent rejuvenators. All of them are rare and endangered Himalayan herbs, unavailable in volumes as needed for commercial production of Ayurvedic products. Ayurvedic lexicons of medieval period mention substitutes for *Ashtavarga* plant drugs through a concept called *Abhava Pratinidhi Dravya*. This project attempted to bring scientific validity to the substitution of *Shatavari (Asparagus racemosus)* for two of Ashtavarga plant drugs, *Meda* and *Mahameda*.

Highlights of progress/ achievements: Through an Ayurvedic etymological analysis of synonyms and their correlation with morphological features, *Meda-Mahameda* were correlated to both *Polygonatum cirrhifolium* and *Polygonatum verticillatum*. The functional characters (as per *Dravyaguna* - Pharmacological perspective of Ayurveda) of *Meda-Mahameda* and their substitute, *Shatavari (Asparagus racemosus)* was found to be similar. They are muscle strength enhancers, rejuvenators, aphrodisiacs and galactogogues. HPTLC and LC-MS analysis of *A. racemosus*, *P. cirrhifolium* and *P. verticillatum* quantified Shatavarin I and IV present in *A. racemosus* as 0.67% w/w and 0.59% w/w, respectively. LC-MS analysis showed some similar peaks in the studied samples. Longevity, aphrodisiac and muscle building potentials of *P. cirrhifolium, P. verticillatum* and *A. racemosus* were studied in *Drosophila melanogaster* model. 10% (v/v) decoctions of *P. cirrhifolium, P. verticillatum* and *A. racemosus* fed group exhibited maximum fecundity (*vrshya*) (>2 fold) measured as compared to *P. cirrhifolium, P. verticillatum*. *Drosophila* fed with 10% (v/v) decoction of test drugs exhibited increased (upto 50-fold) expression of myoglianin gene (gene is involved in the muscle growth and development in Drosophila) compared to control (Figure 1). The activity exhibited by *A. racemosus* was found to be maximum and at least 3-fold higher than that of *P. cirrhifolium* and *P. verticillatum*.

Substitution of *Shatavari* for *Meda-Mahameda*, as a fertility enhancer supporter of muscle function may be considered as valid. Other biological actions like *stanyavardhaka* (galactogogue), *raktadoshahara* (blood purifier), ability to treat *raktapitta* (bleeding disorders), *kshaya* (debility) and *jwara* (fevers) need to be further studied.

Invited Lectures

- Balasubramani SP. Newer approaches to herbal drug standardization. CME on Basic Research Techniques for Ayurveda PG Teachers. Interactive Research School of Health Affairs, Bharathi Vidyapeeth University, Pune. 28th February 2017
- Subrahmanya Kumar Kukkupuni gave a invited talk on "Ayurveda based 'Pathya (wholesome food)' approach to 'drugless' treatment" in XL Indian Social Science Congress held at Mysore during December 2016



Figure 1: A 2% agarose gel showing the 127 bp myoglianin expression in the flies fed with plant extracts

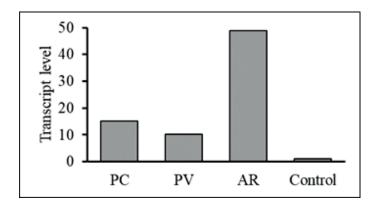


M: 100bp ladder, 1: Myogenin - PC, 2: *RP49*-PC, 3: Myogenin – PV, 4: *RP49* – PV, 5: Myogenin-AR, 6: *RP49* - AR, 7: Myogenin – Control, 8: *RP49*-control.

Figure 2: Myoglianin gene mRNA expression levels in 20 days old *Drosophila* flies fed with *P. cirrhifolium* (PC), *P. verticillatum* (PV) and *A. racemosus* (AR)



Drosophila melanogaster



Centre of Excellence for Medicinal Plants & Traditional Knowledge - Pharmacognosy Studies (CE-P4)

Relevance (scientific/social) of the project: The scientific legitimacy of *Abhava Pratinidhi Dravyas* (substitutes) indicated by Ayurvedic literature as well as traditional practice for rare and endangered medicinal plant drugs is explored through this project. Use of scientifically validated substitutes can augment conservation efforts also.

Highlights of progress/ achievements: During the studies on *Ativisha-Musta* substitute complex, an endophyte was isolated and cultured from *Cyperus scariosus*, one of the substitutes for *Cyperus rotundus* (*Musta*). The culture filtrate was found to have antimicrobial activity against pathogenic organisms like *Vibrio cholera, Enteropathogenic E. coli, Pseudomonas aeruginosa* etc. Alkaloids, saponins and tannins were detected from both plant and endophyte extracts.



School of Life Sciences

Musta (*Cyperus rotundus*) is a substitute indicated for *Ativisha* (*Aconitum heterophyllum*). Since both the drugs were indicated in the management of inflammatory conditions including various types of fevers, *Shothahara* (Anti-inflammatory) activity of these plant drugs were tested using THP1 cell based *in vitro* assays. Effect of various fractions of *Ativisha* and *Musta* on modulating LPS-induced inflammatory cytokines IL-1 α , IL1 β , IL-1RA, IL-6, IL-10 and TNF- α was monitored using ELISA. When compared to control, both drugs showed significant anti-inflammatory effect, in a concentration dependent manner (Figure 1).

Figure 1: Cyperus scariosus: habit and rhizome

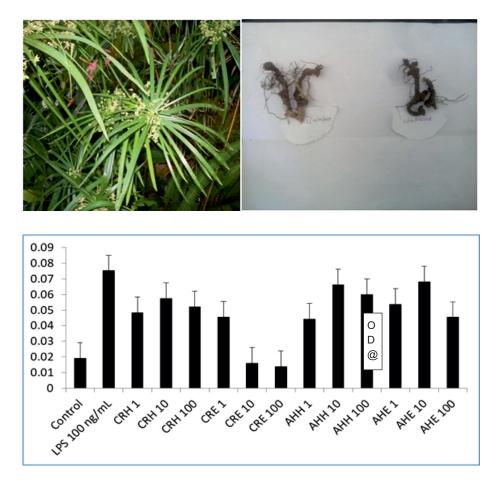


Figure 2: Modulation of IL-1 α by Aconitum heterophyllum and Cyperus rotundus

- AHH- Aconitum heterophyllum, hexane extracts, 1, 10, 100 μg/mL
- AHE- Aconitum heterophyllum, ethanol extracts, 1, 10, 100 μg/mL
- CRH- Cyperus rotundus, hexanes extracts, 1, 10, 100 μg/mL
- CRE- Cyperus rotundus, ethanol extracts, 1, 10, 100 μg/mL

Enhanced livelihoods of women in selected villages of Karnataka through Green Technologies

Relevance (scientific/social) of the project: The Women Technology Park (WTP), a project funded by the Department of Science and Technology aims to build capacities in women from Bangalore periurban villages by providing livelihood and primary health care options. The main activity of the WTP in the current project is to train women Self Help Group (SHG) members in vermicomposting, nursery and propagation techniques, semi-processing, value addition, homestead cultivation of medicinal plants and entrepreneurial skills.

Highlights of progress/ achievements: We have imparted skills to 207 Women SHG members in vermicomposting, nursery and propagation techniques and homestead cultivation of medicinal plants.

- 181 Women SHG members are trained in establishment of home herbal gardens for use in management of their family's primary healthcare needs.
- As a result of our training programs in science and technology areas, 11 women entrepreneurs have already established vermi-composting units and selling the compost to customers and using it in their own farms.
- 2 women have established medicinal plant nurseries.
- Development of individual or collective entrepreneurial skills.



Rasayana therapy for diabetes mellitus: Studies on the effect of *Rasayana* therapy for diabetes mellitus - Scientific validation, chemo prospection and elucidation of functional mechanism of antidiabetic *Rasayana* medicines prescribed in Ayurveda.

Brief background: The emerging trend of opting for complementary and alternate medicines for the management of life style diseases is encouraging but has limited global acceptance due to inadequate information on their mode of action, pharmacodynamics and pharmacokinetics. The research focus of the group is to understand the mode of action of Ayurvedic formulations used in the management of diabetes management.

Program/Activity description:

Objectives of the current study

- Understanding the mode of action of anti-diabetic *Rasayana* formulations using *in-vitro* diabetic models
- Propose scientifically validated *Rasayana-Tantra* as a holistic therapeutic procedure for diabetes mellitus

Highlights of the progress/ achievements: Targeting digestive enzymes and controlling blood glucose is an important approach in diabetes management. Dietary supplements that inhibit digestive enzymes are a promising strategy for managing hyperglycemia in diabetic and borderline patients, particularly those who consume high carbohydrate diets. Ayurveda has lot to offer in this direction. The team reported a possible mode of action of a well-known Ayurvedic anti-diabetic formulation, called *Nisha-Amalaki*, prepared from turmeric (*Curcuma longa*) and amla (*Emblica officinalis*), as a potential of digestive enzyme inhibitor using *in vitro* models. Addition of honey to this formulation found to enhance the pharmacological activities, supporting the Ayurvedic basis of using honey as an adjuvant in anti-diabetic formulations. The study highlights *Nisha-Amalaki* as a potential nutraceutical dietary supplement in the management of diabetes and pre-diabetes.

The team also studied an Ayurvedic formulation, Lodhrasavam, for its mode of action. The pathophysiological cross-talk between diabetes and obesity is well established, but drugs suitable for combined treatment of diabetes and obesity are limited. Ayurveda define obesity as one of the predisposing factors of diabetes and recommends specific formulations for managing obese-diabetes. Lodhrasavam is one such poly-herbal formulation prescribed for obese-diabetic patients. Lodhrasavam has shown to inhibit digestive enzymes activity as well as reduce adipogenesis (obesity marker).

Publications/Research papers/invited talks related to the activity

- Vishnuprasad CN. In-vitro models for screening drug molecules. Invited talk at Acharya & B.M. Reddy College of Pharmacy, Bengaluru on 30.03.2017 as part of the Seminar on Research to Industry-Pharmacological Insights.
- Vishnuprasad CN. Applications of rDNA Technology. Invited talk at Sree Narayana College, Cherthala, Kerala, as part of Hands on Workshop on Tools and Techniques in Biotechnology, Bioinformatics and Cytogenetics, from 17-3-2017 to 27-3-2017.

Preventing extinction and improving conservation status of threatened plants through application of biotechnological tools

Relevance (scientific/social) of the project: This is a Department of Biotechnology, Govt. of India funded multi-centered network project co-ordinated by Prof. Saroj Barik, Director, National Botanical Research Institute, Lucknow. The overall objective of the project is to improve the number of individuals of selected red listed and endangered plants using biotechnological tools.

Highlights of progress/ achievements:

- Survey, population studies and eco distribution mapping of five medicinally important species was conducted viz. Embelia ribes, Adhatoda beddomei, Trichopus zeylanicus, Madhuca insignis and Paphiopedilum druryi using ENM.
- A germplasm bank has been created with 35 medicinally important RET species.
- Macropropagation technique for multiplication of *E. ribes* and *A. beddomei* has been developed. About 500 Individuals of *A. beddomei* and 100 individuals of *E. ribes* has been transplanted to ENM predicted areas so as to increase their numbers in the wild.
- Molecular profiling of A. beddomei and E. ribes has been performed using ITS, RAPD and ISSR markers.
- During 2016 -17, Whole genome sequencing of *E. ribes* was performed to understand the complete genetic make-up of this endangered species. The 660 mb genome of *E. ribes* has been characterized. Annotation of the whole genome data indicated presence of about 51693 genes in *E. ribes*. As this is a de novo sequence further analysis is required for finalizing the genome map of *E. ribes*.

Publications/Research papers/ invited talks related to the activity during the year. Whole Genome Sequence of *Embelia ribes*, an endangered medicinal plant MKEJ00000000 (https://www.ncbi.nlm.nih.gov/nuccore/MKEJ0000000.1). 2016



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Understanding biological effect of Ayurvedic Nootropics

Projects:

- Effect of different dosage forms of Brahmi on neuronal health and Disease
- Mode of action of Ayurvedic Nootropic herbs used in treatment of PD
- Study of mode of action of Ayurvedic Nootropic with a focus on hormesis

Relevance (scientific/social) of the project:

With increasing life expectancy and altered lifestyle, there is a marked increase in age related neurodegenerative disorders. In the absence of effective treatment or management strategy, scientific understanding of use of traditional Ayurvedic nootropics, such as Brahmi, Kapicachhu, Ashwagandha and Shankhapushpi, can help in tackling age related diseases like Alzheimer's and Parkinson's.

Highlights of progress/ achievements:

- Brahmi (Bacopa monnieri) improves short term memory in Caenorhabditis elegans
- Ayurvedic nootropics used in the treatment of Parkinson's Disease show neuroprotective effect by inhibiting MPP+ iodide induced neurodegeneration in *C. elegans* model

Publications/Research papers/invited talks:

- Invited talk titled 'Ayurvedic Nootropics for Enhanced Cognition and Protection from Neurodegenerative Diseases' at 4th International Conference of Drug Discovery India 2016 (29th-30th September 2016)
- Presented a poster in Young Investigator Meeting (YIM) 2017, organized by India Biosciences at Goa between 6th-10th March 2017

Brahmi juice enhances short-term memory in *C. elegans* A) Graphical representation of chemotaxis based short-term memory assay B) Effect of Brahmi juice on retention of learning index 1 h post-conditioning

Neuroprotective effect of Ayurvedic nootropics A) Representative pictures for MPP+ iodide induced degeneration of dopaminergic neurons. Loss of green fluorescence indicates neurodegeneration B) Inhibition of MPP+ iodide induced neurodegeneration by Ayurvedic nootropic herbs. BR- *Bacopa monnieri* (Brahmi), AG- *Withania somnifera* (Ashwagandha), KP- *Mucuna pruriens* (Kapikatchhu), JM- *Celastrus paniculatus* (Jyotismati), BL- *Sida cordifolia* (Bala), MP- *Centella asiatica* (Mandookaparni)



Publications:

- 1. Payyappallimana U, Venkatasubramanian P. 2016. Exploring Ayurvedic Knowledge on Food and Health for Providing Innovative Solutions to Contemporary Healthcare. Front. Public Health 4:57.doi:10.3389/fpubh.00057
- 2. Jain R, Venkatasubramanian P. 2017. Sugarcane Molasses A Potential Dietary Supplement in the Management of Iron Deficiency Anemia. Journal of Dietary Supplements 14(5):589-598. DOI: 10.1080/19390211.2017.1269145
- Prakash BN, Annamalai PA, Naik M, Mahajan V, Gay F, Mathur A, Susanta G, Venkatasubramanian P. 2016. A prospective comparative field study to evaluate the efficacy of a traditional plant-based malaria prophylaxis. J Intercult Ethnopharmacol. <u>6(1): 36-41</u> doi: <u>10.5455/jice.20161112021406</u>.
- 4. Babu V, Singh SK, Venkatasubramanian P, Gajurel PR. 2016. Comparative analysis of major alkaloids in Piper species traded as 'Pippali' in South Indian markets: absence of the chief known constituents-piperine in selected samples. Current Science 3(9).
- 5. Butala MA, Kukkupuni SK, Vishnuprasad CN. 2017. Ayurvedic anti-diabetic formulation Lodhrasavam inhibits alpha-amylase, alpha-glucosidase and suppresses adipogenic activity in vitro. J Ayurveda Integr Med. 8: 145-151.
- Vishnuprasad CN. 2016. Microbial infections and human health: What Ayurveda can offer? Microbial advances in Agriculture and Human Health, Apple Academic Press, Inc., (a Taylor & Francis Group), Canada. pp331-357.

Team:

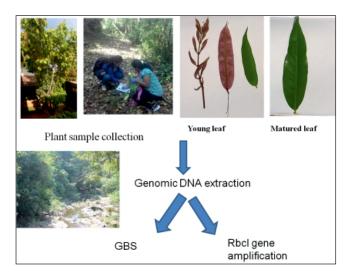
- Dr. Padma Venkat
- Dr. Balasubramani SP
- Dr. Ashwini Godbole
- Dr. Subrahmanya Kumar
- Dr. Vishnuprasad CN
- Mr. Hariramamurthi G
- Ms. Nandini D
- Dr. GC Mamatha Reddy
- Ms. Megha, Research Trainee
- Mr. R. Vidyashankar
- Mr. Anjaneyulu Jalagam
- Dr. Varghese Thomas
- Mr. Manjunath R



School of Life Sciences



Sample collection from Kashmir and Kistwar, Jammu and Kashmir.



Sample collection from Kolluru and GBS technology to identify genetic diversity



Field work at Uttarkhand



Sample collection from Uttarkhand



Elucidation of molecular mechanisms involved in Pistacia-aphid gall development

- Relevance (scientific/social) of the project:
 Pistacia integerrima belongs to family Anacardiaceae widely distributed in North-West and Western Himalayas and called by different names such as kakroi, kakarsinghi and kakarsinghi.

 Pistacia chinensis subsp. Integerrima is well-known for formation of galls on leaves and petioles.
 These galls are horn shaped, formed due to insect attack of Pemphigus species. Need for this study was felt because of the high demand (estimated annual trade: 200-500MT., increased during past two decades), but fluctuation and constant decrease in the supply of Karkatashringi.
 Till date, no studies were taken up on production of galls, interaction of plant & insect as well as bottleneck in gall production.
- Highlights of progress/ achievements:
 a) Gall and leaf sample collection from Uttarkhand
 b) RNA was isolated and sequencing was done
- **Publications/Research papers/ invited talks** related to the activity during the year.
- Visits, academic activities, financial statements etc. also are a part of this annual report. Training in Next Generation Sequencing- RNA seq Data analysis at Bengaluru Genomics Centre, Bengaluru



Genetic diversity assessment of Saraca asoca L distributed across MPCA, Kolluru

Relevance (scientific/social) of the project:

Saraca asoca L. belonging to Fabaceae family growing at an altitude of ~750 m, which is distributed in India especially West Bengal, Assam, Meghalaya, Tripura, Mizoram, Manipur, Nagaland, Odisha, Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, and Maharashtra. The tree is widely distributed in Western Ghats, the Sahyadri region and throughout the Himalayas. (Singh, Krishna *et al.* 2015, Jyothi and Satyavati 2016). This plant has been exploited extensively for medicinal use and therefore it has attained the status of 'Endangered' (Begum, Ravikumar *et al.* 2014). Limited efforts have been taken to increase the *S. asoca* plantation. Therefore, there is a need for method development for *in situ* conservation of *S. asoca* genetic resource. In recent years Genotyping-by-sequencing (GBS) has emerged as a promising genomic approach for exploration of plant genetic diversity on a genome-wide scale (Davey, Hohenlohe *et al.* 2011). There are no studies on assessment of genetic diversity of *S. asoca* using genotyping by sequencing (GBS).

Highlights of progress/ achievements:

- Identification of genotypic variation from natural habitat.
- Understanding the *Saraca asoca* population structure across Kolluru.
- Identification of single nucleotide polymorphism (SNP) markers

Publications/Research papers/ invited talks related to the activity during the year.



Microbiome study of underground parts of Crocus sativus

Relevance (scientific/social) of the project: (not more than 50 words): Plant microbiomes are critical to host adaptation and impact plant productivity and health. Plant Growth-Promoting Rhizobacteria (PGPR) displays several plant-beneficial properties, suggesting that the accumulation of the corresponding genes could have been selected in these bacteria (Ofek-Lalzar et al., 2014). Next generation sequencing technologies have revolutionized the study of complex microbial communities (microbiomes). Root-associated microbiomes vary by soil, geographical location and host genotype in many plants, but no such studies has been done in Crocus sativus till date. *Crocus sativus,* commonly known as Saffron, is the world's costliest spice with medicinal value and one kilogram costs around 11,000 US \$ (Melnyk et al., 2010 Wani et al 2011). It is a sterile triploid plant (3n= 24) and reproduces vegetatively by underground bulb-like, starch-storing organs known as, corms. (Nehvi and Salvee 2010). In the present study, the rhizosphere samples was collected during the flowering stage (November 2016) from two different fields varying in their production as well as geographical location.

Highlights of progress/ achievements: The present study deals with the microbiome analysis of Crocus sativus rhizosphere using next generation meta-transcriptomics and metagenomics sequencing during flowering stage. The rhizosphere samples has been collected during flowering stage (November 2016) from two different fields varying in their production and geographical location. The samples will be analyzed for metagenomic and metatranscriptome sequencing and analysis.

1. Sample collection: The *C.sativus* root samples were collected from the fields in Wuyan, Pampore (Kashmir Disctrict) and Berwar, Kishtwar (Jammu District) during flowering stage (November 2016). The saffron fields of Wuyan village (74°58′0″E, 34°1′30″N, 5173ft) are more productive in comparison to the saffron fields in Berwar, Kishtwar (75°76′62″E, 33°31'16″N, 5374ft). The composite sampling was done as per the protocol of Luster and coworkers (2009) wherein the *C.sativus* roots were collected from the three corners of five fields of each location and pooled together to form triplicates samples. The roots were collected in RNA later for the metatranscriptomic analysis and were stored in -800C until further processing.

2. Soil Analysis: The soil samples has been sent for analysis of physicochemical properties like pH, electrical conductivity, organic Carbon, Calcium, Magnesium, bulk density, available Nitrogen, Phosphorus and Potassium to SKAUST-J and the results are awaited.



3. Nucleic Acid Extraction: The Metatranscriptomic RNA was extracted from the microbiome of Crocus sativus rhizosphere being grown in the fields located in Kishtwar and Pulwama District using conventional method (Costa et al., 2004; Mettle et al., 2010; Ofek et al., 2013) as well as commercial kit RNA PowerSoil[®] Total RNA Isolation Kit (MoBio). RNA extracted using MoBio kit was having better quality and quantity as compared to conventional method.

4. Metatranscriptomic library preparation and sequencing: The metatranscriptomic RNA samples have been sent for metatranscriptome library preparation and sequencing to service provider.

5. Submission of yearly annual progress report, statement of expenditure and utilization certificate. **Publications/Research papers/invited talks** related to the activity during the year.

- Ambardar S, Heikham RS, Gowda M and Vakhlu J (2016) Temporal and spatial changes in the fungal community associated with belowground parts of *Crocus sativus* during flowering and dormant growth stages. PLOSone. 11(9): e0163300. doi: 10.1371/journal.pone.0163300. Impact factor: 3.234
- Ambardar S, Gupta R, Trakroo D, Lal R and Vakhlu J (2016) High Throughput Sequencing: An overview of sequencing chemistry Indian Journal of Microbiology. 56(4):394-404 DOI 10.1007/s12088-016-0606-4. Impact factor: 1.143

Team members

Dr. Malali Gowda Dr. Abdul Kareem Dr. Anbarashan Dr. Ravikumar K Mr. B S Somasekhar Dr. Pavithra N Dr. Sheetal Ambardar Dr. Noorunnisa Begum





Indian Medical Heritage Day



Lighting the Lamp (Shri. Darshan Shankar, Prof. Ramaswamy, Ms. Lakshmi Gopalaswamy, Ms. Shweta Rawat, Swami Sunildas and Her Highness Pramoda Devi Wadiyar.





Her Highness Pramoda Devi



His Highness Sri Srikantadatta Narasimharaja Wadiyar Medical Heritage Library

The University Library (His Highness Sri Srikantadatta Narasimharaja Wadiyar Medical Heritage Library) focuses on developing multi-disciplinary, multi-format information resources collections providing knowledge and wisdom from various Indian systems of medicine. It is aimed at providing a **'one stop solution'** for knowledge and resource sharing. Over the last 23 years, the library has a repository of rich collection of books pertaining to Ayurveda, conservation, bio diversity, Indian medical heritage etc.

Presently TDU is looking to expand its collections with multi-disciplinary resources from Biomedicine, Life Sciences, Social Sciences, Performing and Fine Arts, Engineering and Management.

Activities during the year

- Total library books have scaled up to 8400. Around 350 of them were added this year. The library subscribes to 10 key journals and 2 magazines.
- Library provides access to 175 e-books on Ayurveda, History of Medicine, Science and Biomedicine through Library OPAC an online software.
- Around 3000 books were issued to the staff during the year, out of which 1500 books were permanently transferred to sub-libraries in different departments to facilitate regular reference for the project work.
- The TDU library has been established in memory of His Highness Late Sri Srikantadatta Narasimharaja Wadiyar. TDU celebrated the first anniversary of 'His Highness Sri Srikantadatta Narasimharaja Wadiyar Medical Heritage Library' as 'Indian Medical Heritage Day' at TDU campus on 19th February 2017 between 10.30 AM to 4.00 PM. The event started with launching of 'Digital Resource Center of Ancient Medical Books and Manuscripts' by Her Highness Pramoda Devi Wadiyar. After the inauguration, scientific sessions on 'Wellness Research & Practice' commenced. Series of interesting lectures were given by eminent personalities on Wellness (swasthya) and Regenerative Biology followed by a Panel Discussion. Participants from partner institutes, researchers, clinicians, scientists, PhD students, UG and PG students from Ayurveda, Allopathic and Basic Sciences participated in this event.



рана (2010) - с		74/2, Jarakabano	le Kaval, Post At	DF LOCAL HEALTH TRADITIONS (FRLHT) tur, Yelahanka, Bangalore 560 064 AT MARCH 31, 2017			FRLHT
Corpus & Liabilities	SCH REF	As at 31st Mar 2017	As at 31st Mar 2016	Assets	SCH REF	As at 31st Mar 2017	(Amount in Rs As at 31st Ma 2016
		Rs.	Rs.			Rs.	Rs.
General Funds	A	14,20,84,493	10,46,98,049	Fixed Assets	н	39,89,46,984	38,84,99,84
Reserves	В	39,89,46,984	38,84,99,847	Investments Corpus Investments		44,90,36,184	44,39,88,72
Corpus Funds	с	44,90,36,184		Other Investments		8,96,88,910	6,77,76,8
Earmarked Funds (Appropriation Funds)	D	5,95,66,713		Assets, Loans and Advances		-,,,	-,,
Project Grants	E	4,04,52,013	5,15,41,892	Cash on hand Bank balances	к	4,36,486 7,30,46,965	
Non-Current Liabilities	F	1,36,49,432		Non-Current Assets Other Current Assets	L	1,43,81,952 2,55,10,091	1,26,88,43
Current Liabilities	G	62,52,695		Closing Stock Loans and Advances	N	28,65,505 5,60,75,437	34,63,76
		1,10,99,88,514	1,02,07,25,941			1,10,99,88,514	1.02.07.25.9

1,10,99,88,514 1,02,07,25,941 As per our report of even date attached

For Foundation For Revitalisation of Local Health Traditions (FRLHT)

(Darshan Shankar) Managing Trustee

Place: Bangalore

Date: 16-10-2017

Sile (S Ramaswamy) Trustee

CLATES MARTERE (Suresh Hegde) Asst. Director - Finance & Accounts

YCRJ & Associates Chartered Accountants Firm Reg no. 0069275 (CA Rajnish Rama Rao)

Partner M. No. 202465



INCOME AND EXPENDITURE AG	CCOUNT FOR THE Y	EAR ENDED MARCH	1 31, 2017	
Expenditure	Project Expenses	Administration & Scientific Research Expenses	Hospital Expenses	Total Expenditure
Opening Stock		-	34,63,766	34,63,766
Hospital - Purchase & Cost of Goods Sold	-	-	1,95,99,001	1,95,99,001
Books, Periodicals & Other Literature	90,414	225	46,967	1,37,606
Communication Costs	2,26,415	45,986	5,12,851	7,85,252
Consultants & Outsourced Services	47,17,735	13,91,215	1,18,37,826	1,79,46,776
Consumables	55,61,550	4,86,365	51,30,827	1,11,78,742
Database Creation & Documentation	2,35,300	7,500	-	2,42,800
Field Work & Trials	5,05,820	6,858	-	5,12,678
IAIM Research Expenses	-	1,00,35,639	-	1,00,35,639
IT Hardware, Software & Services	1,12,461	3,450	-	1,15,91
Maintenance, Utilities, Repairs & Improvements	19,17,305	16,62,297	44,85,011	80,64,613
Marketing, Advertising & PR	-	-	2,33,036	2,33,036
Meeting, Conferences & Workshop	2,65,290	25,368	-	2,90,658
Other Overheads & Contingencies	22,24,051	14,06,334	53,79,219	90,09,604
Printing & Multimedia Publishing	7,62,466	2,88,433	4,29,774	14,80,673
Salaries Including Fellowships	2,55,63,296	73,76,540	4,70,66,983	8,00,06,819
Training & Capacity Building	1,26,938	6,000	-	1,32,938
Travel & Conveyance	51,60,423	4,95,162	12,53,455	69,09,040
Depreciation	-	2,06,81,231	-	2,06,81,231
Less: Depreciation transferred to Capital Reserve	-	(2,06,81,231)	-	(2,06,81,231
Total Expenditure (A)	4,74,69,464	2,32,37,372	9,94,38,716	17,01,45,552
Income	Project Income	Administration & Scientific Research Income	Hospital Income	Total Income
Project Income Recognition (to the extent project fund utilised)	4,74,69,464	-	25,29,350	4 00 00 014
Less: Project income transferred to project fund	(57,97,662)	-	25,29,350	4,99,98,814
Donation Received	45,50,000	5,24,83,917	20,00,000	(57,97,662
Ethno Medical Garden	45,50,000	39,33,892	20,00,000	5,90,33,917
Hospital - Sales		59,55,892	-	39,33,892
		-	3,33,74,446	3,33,74,446
Hospital Receipts			5 36 66 874	5 26 66 07

		income		
Project Income Recognition (to the extent project fund utilised)	4,74,69,464	-	25,29,350	4,99,98,814
Less: Project income transferred to project fund	(57,97,662)	-	-	(57,97,662)
Donation Received	45,50,000	5,24,83,917	20,00,000	5,90,33,917
Ethno Medical Garden	-	39,33,892	-	39,33,892
Hospital - Sales		-	3,33,74,446	3,33,74,446
Hospital Receipts	-	-	5,36,66,874	5,36,66,874
Income from Projects		20,70,716	-	20,70,716
Interest on investments and savings bank account	12,47,662	4,81,63,215	25,55,830	5,19,66,707
Miscellaneous Income	-	14,30,418	23,23,232	37,53,650
Rent Income	-	12,11,467	-	12,11,467
Transfer to General Fund	-	-	-	-
Closing Stock		-	28,65,505	28,65,505
Total Income (B)	4,74,69,464	10,92,93,625	9,93,15,237	25,60,78,326
Excess of Income over Expenditure (B-A)	- 1	8,60,56,253	(1,23,479)	8,59,32,774

As per our report of even date attached

For Foundation For Revitalisation of Local Health Traditions (FRLHT)

YCRJ & Associates Chartered Accountants Firm Reg no. 0069275

Mulu (Darshan Shankar) Managing Trustee

Place: Bangalore Date: 16-10-2017

(S. Ramaswamy)

Trustee



FOUNDATION FOR REVITALISATION OF LOCAL HEALTH TRADITIONS (FRLHT) 74/2, Jarakabande Kaval, Post Attur, Yelahanka, Bangalore 560 064

FRLHT

Receipts	Amt	Payments	Amt
Opening Balances		Project Payments	
Bank	6,74,56,051	Books, Periodicals & Other Literature	90,41
Cash		Communication Costs	2,26,41
Investments (Fixed Deposits)	6,77,76,862	Consultants & Outsourced Services	46,92,73
Designed Descripto		Consumables	55,61,55
Project Receipts Donation Received	45 50 000	Database Creation & Documentation Field Work & Trials	2,35,30
Interest on SB a/c and Investments		Fixed Assets	5,04,92
Miscellaneous Income		IT Hardware, Software & Services	14,15,62
Project Grants Received		Loans & Advances	20,10,94
		Maintenance, Utilities, Repairs & Improvements	19,17,30
		Meeting, Conferences & Workshop	2,65,29
		Other Overheads & Contingencies	22,20,36
		Printing & Multimedia Publishing	7,62,46
1		Return to Funders / Transfer to other funds	1,52
		Salaries Including Fellowships	2,54,63,79
	-	Training & Capacity Building	1,26,93
		Travel & Conveyance	51,60,42
Administration & Scientific Research Receipts	-	Administration & Scientific Research Payments	-
Refund of TDS	3.449	Books, Periodicals & Other Literature	22
Refund of Advances		Communication Costs	45,98
Rent Income		Consultants & Outsourced Services	13,91,21
Miscellaneous Income	14,21,480	Consumables	5,01,26
Project Income	20,70,716	Corpus investments during the year	50,67,51
Ethno Medical Garden	39,28,264	Database Creation & Documentation	7,50
Interest on SB a/c and Investments		Field Work & Trials	6,85
Donation Received	5,24,83,917	IAIM Research Expenses	1,00,35,63
	-	IT Hardware, Software & Services	3,45
		Maintenance, Utilities, Repairs & Improvements	16,62,29
		Meeting, Conferences & Workshop	25,36
		Other Overheads & Contingencies Printing & Multimedia Publishing	15,20,959
		Purchase of Fixed Assets	19,200
		Return to Funders / Transfer to other funds	8,79,35
		Salaries Including Fellowships	84,29,179
		Training & Capacity Building	6,000
		Travel & Conveyance	4,93,183
Hospital Receipts		Hospital Payments	
Donation Received		Books, Periodicals & Other Literature	48,417
Hospital - Sales Hospital Receipts		Communication Costs	5,12,851
Interest on SB a/c and Investments		Consultants & Outsourced Services	1,22,22,554
Miscellaneous Income		Consumables Fixed Assets	52,69,600
Project Grants Received		Hospital - Purchase & Cost of Goods Sold	71,07,287
Refund of Advances		IT Hardware, Software & Services	10,340
		Loans & Advances	5,59,869
		Maintenance, Utilities, Repairs & Improvements	44,47,011
		Marketing, Advertising & PR	2,33,036
		Other Overheads & Contingencies	57,84,154
1		Printing & Multimedia Publishing	4,22,166
		Return to Funders / Transfer to other funds	44,18,303
		Salaries Including Fellowships	4,46,30,201
		Travel & Conveyance	12,53,455
let Settlement of Advancer	100.011		
let Settlement of Advances	4,99,916	Advance to TDU	5,23,98,716
		Closing Palanese	-
		Closing Balances Bank	700.00
		Cash	7,30,46,964
		Investments (Fixed Deposits)	4,36,486
	40,56,82,281	(inco ocposits)	40,56,82,281

For Foundation For Revitalisation of Local Health Traditions (FRLHT)

VI ul 7 (Darshan Shankar) -(S Ramaswamy) Trustee

Managing Trustee

Place: Bangalore Date: 16-10-2017

(Suresh Hegde) Asst. Director-Finance & Accounts

YCRJ & Associates ASSO Chartered Accountants Firm Reg no. 006927S M * CHAR BANGALORE + (CA Rajnish Rama Rao) Partner M. No. 202465 DACCO



		BAL	ANCE SHEET A	S AT MARCH 31, 2017			
	SCH As	at 31st Mar	As at 31st Ma	r	SCH As at 3		nount in Rs at 31st Ma
Corpus & Liabilities	REF	2017	2016 Rs.	Assets	REF 20	17 Is.	2016 Rs.
General Funds	A (Rs. 3,12,46,042)	-	Fixed Assets		,98,785	-
Reserves	в	4,31,149	-	Investments			
Corpus Funds	c		-	Corpus Investments	н		-
Project Grants	D	29,48,915		Other Investments	I 68	,91,000	
Non-Current Liabilities	E		-	Assets, Loans and Advances Cash on hand		70,856	-
Current Liabilities		5,40,02,310		Bank balances Non-Current Assets		,20,023	
				Other Current Assets Loans and Advances	L 9	,50,262	-
		2,61,36,332	-			,36,332	- ate attache
For Institute of Transdisciplinary Health Sci	ences & Techr	ology (TDU)		(Chartered.	& Associate Accountant no. 006927
0		M	L.	(THE	R	at	\sim
(Darshan Shankar)	1	(M an ohar		(Suresh Hegde)		ICA Rajnis	h Rama Rad
Vice-Chancellor		Regi	strar	Deputy Registrar - Finance & Accounts	(S)	CA	Partne No. 20246
Place: Bangalore Date: 16-10-2017					A BAI	GALORE	
					ANTON	ACCOUNT	
					a section of the	ALC	
	74/2,	Jarakabande	Kaval, Post Attu	HEALTH SCIENCES & TECHNOLOGY Jr, Yelahanka, Bangalore 560 064 TTHE PERIOD 11/04/2016 TO 31/03/2017			
Expenditure roject Expenditure	74/2,	Jarakabande EXPENDITURI Amt	Kaval, Post Attu	ur, Yelahanka, Bangalore 560 064 R THE PERIOD 11/04/2016 TO 31/03/2017 Income		(A Amt	mount in R
roject Expenditure ooks, Periodicals & Other Literature	74/2,	Jarakabande EXPENDITURI Amt Sub Total 7,660	Kaval, Post Attu E ACCOUNT FOR Total P P	ur, Yelahanka, Bangalore 560 064 R THE PERIOD 11/04/2016 TO 31/03/2017 Income <u>roject Income</u> roject Income	niise 47,92,471	(A Amt Sub Total	mount in R Total
roject Expenditure ooks, Periodicals & Other Literature ommunication Costs onsultants & Outsourced Services	74/2,	Amt Sub Total 7,660 7,749 31,629	Kaval, Post Attu E ACCOUNT FOR Total P I	ur, Yelahanka, Bangalore 560 064 R THE PERIOD 11/04/2016 TO 31/03/2017 Income Project Income Project Income Recognition (<i>To the extent project fund ut</i> tear: Projet mome trongkered to Project Fund	ation 47,92,471 52,217 52,217 52,217	(# Amt Sub Total	
roject Expenditure ooks, Periodicals & Other Literature ommunication Costs onsultants & Outsourced Services onsumables	74/2,	Jarakabande EXPENDITURI Sub Total 7,660 7,749 31,629 2,02,313	Kaval, Post Attu E ACCOUNT FOR Total <u>P</u>	ur, Yelahanka, Bangalore 560 064 R THE PERIOD 11/04/2016 TO 31/03/2017 Income roject Income roject Income Recognition (<i>To the extent project fund ut</i> therest on Savings Bank A/c	alise 47,92,471 52,217	(/ Amt Sub Total	
roiect Expenditure ooks, Periodicals & Other Literature ommunication Costs onsultants & Outsourced Services onsumables edd Work & Trials taintenance, Utilities, Repairs & Improvements	74/2,	Jarakabande EXPENDITURI Sub Total 7,660 7,749 31,629 2,02,313 60,000 21,000	Kaval, Post Attu	ur, Yelahanka, Bangalore 560 064 R THE PERIOD 11/04/2016 TO 31/03/2017 Income Project Income Project Income Recognition (<i>To the extent project fund ut</i> tear: Projet mome trongkered to Project Fund	ation 47,92,471 52,217 52,217 52,217	(# Amt Sub Total	
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torject.Expenditure olisk, Periodicalis & Other Literature omsunalita & Outsourced Services onsumables eld Work & Trialis itanitenance, Utilities, Repairs & Improvements teeting, Conferences & Workshop ther Overheads & Contingencies initing & Stationery alaries Including Fellowships raining & Capazity Building ravel & Conveyance niversity Expenditure ooks, Periodicals & Other Literature omsunciato Costs onsumables	74/2,	Jarakabande EXPENDITURI Sub Total 7,660 7,749 31,629 2,002,313 60,000 2,1000 1,71,043 5,91,965 2,33,740 12,30,895 3,570 12,37,740 76,400 5,12,448 15,13,511 2,43,780	Total P Total P P II II II III III III III	Ir, Yelahanka, Bangalore 560 064 It HE PERIOD 11/04/2016 TO 31/03/2017 Income Project Income Project Income Recognition (<i>To the extent project ford ut</i> Interest on Savings Bank A/C Less: Totentione transferred to Project Fund Less: Transfer to Capital Reserve Interest on Capital Reserve Interest on Capital Reserve Income on Investments & SB Account a) Interest on Fued Deposits	ofine 47,92,92,47,92,92,47,92,92,47,92,92,92,47,92,92,92,92,92,92,92,92,92,92,92,92,92,	(/ (Amt Sub Total	Total
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74/2			ALTH SCIENCES & TECHNOLOGY (elahanka, Bangalore 560 064	DELTI-	
RECEIPTS & PAYMENTS ACCOUNT FOR THE PERIOD 11/04/2016 TO 31/03/2017					mount in Rs.)
Receipts		Amt	Payments		Amt
Opening Balance					
Cash		0			
Bank .		0			
Project Receipts		Ŷ	Project Payments		
Project Grants Received	74,32,678		Books, Periodicals & Other Literature	7,660	
Interest on Savings Bank A/c	52,217		Communication Costs	7,749	
			Consultants & Outsourced Services	31,629	
			Consumables	2,02,313	
			Field Work & Trials	60,000	
			Maintenance, Utilities, Repairs & Improvements	21,000	
			Meeting, Conferences & Workshop	1,71,043	
			Other Overheads & Contingencies	5,85,050	
			Printing & Stationery	2,34,921	
			Salaries Including Fellowships	21,30,895	
			Training & Capacity Building	3,570	
			Travel & Conveyance	12,37,740	
		74,84,895	Purchase of Fixed Assets	91,986	47,85,55
University Receipts			University Payments		
Salary Contribution From Projects	2,41,18,309		Books, Periodicals & Other Literature	92,750	
Project Overheads	6,80,123		Communication Costs	5,12,448	
University Course Fees	13,42,700		Consultants & Outsourced Services	12,97,511	
Interest on Savings Bank A/c	1,11,863		Consumables	2,43,780	
Miscellaneous Income (Transport recovery & other misc receipts)	9,65,058		IT Hardware, Software & Services	4,67,073	
Training Fees	4,40,975		Maintenance, Utilities, Repairs & Improvements	73,56,988	
Hostel & Guest House Fees	20,52,429		Meeting, Conferences & Workshop	50,053	
Contribution to Research Development Fund	3,36,000		Other Overheads & Contingencies	18,00,676	
Advance from FRLHT	5,23,98,716		Printing & Stationery	5,83,779	
			Marketing, Advertising & PR	3,56,326	
			Salaries Including Fellowships	4,49,77,506	
			Training & Capacity Building	25,000	-
			Travel & Conveyance	21,66,075	
			Loans & Advances	3,26,869	
		8 74 46 173	Purchase of Fixed Assets Investments during the year	25,06,799	6,96,54,63
		0,24,40,173	investments during the year	00,02,000	-,,- ,,,
			Closing Balance		-
			Bank		1,54,20,02
			Cash		70,85
Total		8,99,31,068	Total		8,99,31

For Institute of Transdisciplinary Health Sciences & Technology (TDU)

(Darshan Shankar) Vice-Chancellor

Place: Bangalore Date: 16-10-2017

othar Kashyap) Registrar

(Suresh Hegde) Deputy Registrar - Finance & Accounts

Chartered Accountants Firm Reg no. 0069275 N R 2 (CA Rajnish Rama Rao) Partner ASSOCIATIN . 202465 BANGALORE SLA

RED ACC

YCRJ & Associates







The University of Trans-Disciplinary Health Sciences and Technology

No. 74/2, Jarakabande Kaval, Post Attur, Via Yelahanka, Bangalore - 560 064 Ph: 080 28568000, Website: tdu.edu.in

