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ENVIS Newsletter on Medicinal Plants

Contents

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Editorial

Dear Friends, Greetings to you!

Time has come again for sharing experiences related to Medicinal Plants Conservation efforts across our country. Well, this time too, our Volume 8, is exclusively packaged with innovative conservation measures, initiatives by industries, academicians and researchers. Many of the efforts are supported by government and private research programmes.

In this volume, we have a story quite different from others, because it is from an industry, which has made an effort to change for better today and tomorrow. It is all in our way of thinking? The article titled: "Going Back to the Roots: *Brihat panchamoola*" is woven with learning experiences of Dabur Research Group, towards resource augmentation of selected *Dashamoola* plant species. Their entire journey is about determining the harvesting age for roots of *Brihat panchamoola* and assess the younger roots of this sub-group to substitute the bark, based on biological activity. This rational move and innovativeness put together have resulted in less pressure on wild resources and thus finding alternatives by not compromising on quality. Hope each one of you will draw inspiration and get ideas from such moves towards sustainable use of resources.

Story of *Guggul* (*Commiphora wightii*), tells us about the status of the plant, how the oleoresin is tapped, what happens to the plant, if people do unscientific harvest? what is being done to conserve this plant? Let's read to know more about it. Coupled with this is an article on propagation trial of one of the important Western Ghats plant, *Salacia chinensis* (*Ekanayakam*). This plant is synonymous with diabetes! From Sikkim Himalayas, we have a profile of medicinal orchid, *Platanthera edgeworthii*, which forms part of *Ashtavarga* drug "*Vriddhi*". An article on edible and medicinally important fruits of Kashmir Himalayas shows the market potential of local bio-resources and appreciation to traditional knowledge. For informed conservation action programs, we need to know the species of focus. This volume shares the results of Conservation Assessment Management Prioritization (CAMP) exercises for selected Indian states.

Like "Every drop of water makes an ocean!" we have to make "every move to conserve the resources". This is a responsible act! We will be delighted, if you find the write-ups meaningful, thought provoking and inspiring. Reciprocate with us via email: *envis@frlht.org / frlht@envis.nic.in*

With Best Season's Greeting

Suma T. S.
Editor, MEDPLANT

ENVIS Centre on Medicinal Plants

Foundation for Revitalisation of Local Health Traditions(FRLHT), Bangalore is a registered public trust, since 1991. Our vision is to "revitalise Indian Medical Heritage". Our mission is to design and implement strategic programs in the three key thrust areas that will have high social impact:

A. High priority research and education on Indian systems of medicine
B. Conservation of threatened natural resources used by Indian systems of medicine
C. Strategic outreach initiatives for widespread application and dissemination of knowledge of Traditional Health Sciences.

ENVIS Centre on Medicinal Plants is an integral and inseparable part of Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore. It started in 2002, as node and now a Centre! Today, we see ourselves as a unique podium to Collect, Curate and Disseminate authentic Multi-Dimensional Information on Indian Medicinal Plants via communication media. During 2014-2015 web statistics shows 10506694 hits & 871754 visitors for *envis.frlht.org* and 48744 visitors for the new website: *frlhtenvis.nic.in*

Centre is financially supported by Ministry of Environment Forests and Climate Change Government of India. To know more about us, just email us: *envis@frlht.org , frlhtenvis@nic.in*

Next issue: Medicinal Plants Conservation Efforts across the country ...continued.

Discussion

Exports of Indian Medicinal Plants- Need for Improving the Data Generation

D. K. Ved

As was brought out in an earlier issue of ENVIS Newsletter on Medicinal Plants, in March 2012, the exports related data for medicinal plants is obtainable from the periodically published reports of "Directorate General of Commercial Intelligence and Statistics" (DGCIS) of Govt. of India. All exports of goods get recorded through the Indian customs EDI system (ICES) and are enlisted with specific HS (Harmonized System) codes. Six digit HS codes, prescribed for international trade by the World Custom Organization, have been expanded to Eight digit Indian Trade Classification Codes, referred as ITC (HS) codes, to improve the details of specific goods exported from India. However, the currently prevailing eight digit ITC (HS) codes are not rigorous enough to capture and reflect the diversity of Indian medicinal plants and their specific parts/ products, under exports. As a result, the compiled data available in DGCIS reports, enlisting the entities as per these Eight digit ITC (HS), does not reveal the specific species (and their parts) of medicinal plants being exported. This has implications for documentation, monitoring and regulation of India's biological resources as envisaged under the Biological Diversity Act 2002.

The need to address this anomaly has been recognized by the National Biodiversity Authority (NBA) and MoEF & CC of Govt. of India and a process has been set in motion to work out an appropriate solution, so that the data relating to exports of bio-resources gets recorded with more precise details. The NBA is currently engaged with this exercise to develop a proposal for enlarging the number of digits, used for recording the exports as per ITC (HS) codes. The additional digits will not only help in defining the precise biological resource, as per its scientific nomenclature, but also reveal the specific part/ natural product involved as well the source of supply (wild or cultivated). For this purpose six or eight additional digits may have to be added to the existing codes. Once, such an enlarged coding system is put into practice, the details pertaining to exports will record the specific medicinal plant species, its parts/natural products as well the source of supply (wild or cultivated). Thus paving the way for improved documentation and regulation of exports of bio-resources as needed under the Biological Diversity Act 2002.

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Conservation Status of *Ashtavarga* Drug "*Vriddhi*" in Sikkim Himalayas

D. K. Agrawala[1], T. K. Mandal[2] and Chinmay Rath[3]

Ashtavarga, is a polyherbal ayurvedic formulation having properties to enhance longevity, health and vigor. It is an important ingredient of "*Chavyanprasha*" and thus the source plants are under severe threat for exploitation from their natural habitats.

In classical Ayurvedic literature, these drugs are characterized in Sanskrit through various "*slokas*" without any reference to the present binomial nomenclature. Even today, there is no definite protocol or system existing to establish botanical identity of Ayurvedic drugs described in the classical texts. Considering the morphology, properties and action of the locally available plants, *Vaidyas* and practitioners have been correlating them with the small description available in the "*slokas*" and establishing the botanical identity.

In this way, the botanical identity of "*Vriddhi*", one of the ingredients of *Ashtavarga*, has been worked out as *Platanthera edgeworthii* (Hook. f. ex Collett) R. K. Gupta [syn. *Habenaria edgeworthii* Hook. f. ex Collett] in Sharma and Bal Krishan (*Vitality Strengthening Astavarga Plants*, 2005). In fact, they have erroneously included *Habenaria edgeworthii* Hook.f. ex Collett as a synonym under *Habenaria acuminata* Lindl. Actually, *Habenaria acuminata* (Thwaites) Trimen (not authored by Lindle, as mentioned in Sharma and Bal Krishan, 2005) is native of Sri Lanka and T. A. Rao [*Bull. Bot. Surv. India* 2: 89. 1960] has misidentified a specimen (*T. A. Rao 4270, BSD*) of *Platanthera edgeworthii* collected from Dakuri pass, Uttarakhand and attributed the name *Habenaria acuminata* Thw. These are two distinct species with different morphology and the later is not distributed in the Himalayan region.

Though this plant has been in use since ancient period in the name of "*Vriddhi*" its binomial discovery dates back to 1902 when H. Collett in "*Flora Simlensis*" validly published J. D. Hooker"s nude name *Habenaria edgeworthii*. Later, considering the generic characters, it had been transferred to *Platanthera* by R. K. Gupta in 1968 and presently known as *Platanthera edgeworthii*.

Continued in page 8.....

Going Back to the Roots: *Brihat panchamoola*

N. B. Brindavanam

Introduction:

As implies by its name, *Dashamoola* is a Fixed Dose Combination (FDC) of 10 root drugs used in the Ayurvedic formulations. This combination can be further divided into two sub groups viz. *Brihat panchamoola* (roots of five tree species) and *Laghu panchamoola* (roots of five herbaceous species). The table 1, enlists the plant entities in the sub groups. This combination inturn is used in many classical Ayurvedic formulations like *Chyawanprasha, Dashmoolarishta*, *Dashamoola Taila, Mahanarayana Taila* etc. Interestingly, the member species are rarely used in isolation. On a careful scrutiny, one may observe the usage of *Bilva, Kantakari* and *Gokshura* in isolation. But independent use of *Agnimantha*, *Syonaka*, *Patala* and *Gambhari* is virtually absent. This phenomenon places *Dashamoola* into an exclusive bracket of Ayurvedic pharmaceutics.

At the same time, the first subgroup of this combination *Brihat panchamoola* is also associated with conceptual and environmental complexities:

a) Going by the name, one may consider usage of roots for all the members of this combination. Given the habit of these 5 species, scholars differ in interpretation of *moola*. Often they recommended the use of *moola-twak* (root bark), perhaps due to woody nature of roots in matured trees.

b) With industrialization, the root bark was gradually replaced from stem/trunk bark. However, this practice is also associated with high degree conservation concerns.

c) More in particular, such concerns get multiplied in environmentally sensitive species like *Syonaka* and *Patala,* which are widely distributed and not abundant.

d) Of the 5 members of *Brihat panchamoola,* botanical identity is uncertain for two species.

I) In case of *Syonaka*, both *Ailanthus excelsa* and *Oroxylum indicum* are generally considered. However, The Ayurvedic Pharmacopoeia of India (API) recognised the later species as *Syonaka*

Table -1 **Plant entities in *Dashamoola***

Brihat panchmoola		*Laghu panchamoola*	
Sanskrit name	**Botanical name**	**Sanskrit name**	**Botanical name**
Bilva	*Aegle marmelos (L.) Correa*	*Salaparni*	*Desmodium gangeticum (L.) DC.*
Agnimantha	*Clerodendrum phlomidis* L.f. Alternative sp. *Premna serratifolia* L. (Syn. *P. integrifolia* L.)	*Prishnaparni*	*Uraria picta* (Jacq.)DC.
Syonaka	*Oroxylum indicum* (L.) Kurz Alternate sp. *Ailanthus excelsa* Roxb.	*Kantakari*	*Solanum virginianum* L. (Syn. *S. surratense* Burm f./ Syn. *S. xanthocarpum* Schrad. & H. Wendle)
Patala	*Stereospermum chelonoides* (L.f.) DC. [Syn: *S. suaveolens* (Roxb.)DC.]	*Brihati*	*Solanum anguivi* Lam. (Syn. *S. indicum* auct. non L./ *S. violaceum* Ortega)
Gambhari	*Gmelina arborea* Roxb.	*Gokshura*	*Tribulus terrestris* L.

Aegle marmelos

Clerodendrum phlomidis

Premna serratifolia

ii) In case of *Agnimantha, Clerodendrum phlomidis* is widely accepted as correct botanical entity. Nonetheless, there continues to be a school of thought that, *Premna serratifolia* (syn: *P. integrifolia*) should be taken as *Agnimantha*. Some scholars classify them as *Laghu Agnimantha* (*C. phlomidis*) and *Brihat Agnimantha* (*P. serratifolia*).

Of all the complexities, sustainability concerns associated with bark stripping need to be addressed scientifically and on priority. Such imperative needs to be examined from a fact that the annual demand for each of *Brihat panchamoola* members ranges between 1200-3000 MT.

Genesis of the Project:

Considering the importance of the *Dashamoola* group, National Medicinal Plants Board, launched a concerted effort to address these concerns. As a first step, the Board supported resource augmentation projects in the states of Gujarat, Maharashtra and Odisha. Concurrently, a project was funded to determine the harvesting age for roots of *Brihat panchamoola* group as proposed by Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola (PDKV). Eventually, Dabur Research & Development Centre (DRDC) submitted a comprehensive concept note to assess the younger roots of this sub-group to substitute the bark basis of biological activity. The proposal was structured on hypothesis that:

1. The phytochemical activity of tree species could be optimal during their formative years. As such the younger plants might offer desired biological activity.
2. While *Brihat panchamoola* seeks to use the roots of tree species. It is necessary to determine the age of their harvesting. Roots of younger plants could be potential candidates in this direction.
3. If the age of roots is standardized to biological activity, they can be produced in high-density short term protocols.

The Board approved the proposal and favoured to integrate the project of PDKV to make the entire endeavour comprehensive.

The project is carried out with a focus on (a) assessment of substitutable plant part with reference to its efficacy and safety profile and its comparability with the current usage practices, and (b) development of protocols for its production on commercial scale to ensure the availability of new plant part. The Eicosanoids, Inflammation & Cancer Research Group, School of Life Sciences, University of Hyderabad was one of the project partners to study anti-inflammatory profile of study samples using "*in-vitro*" models.

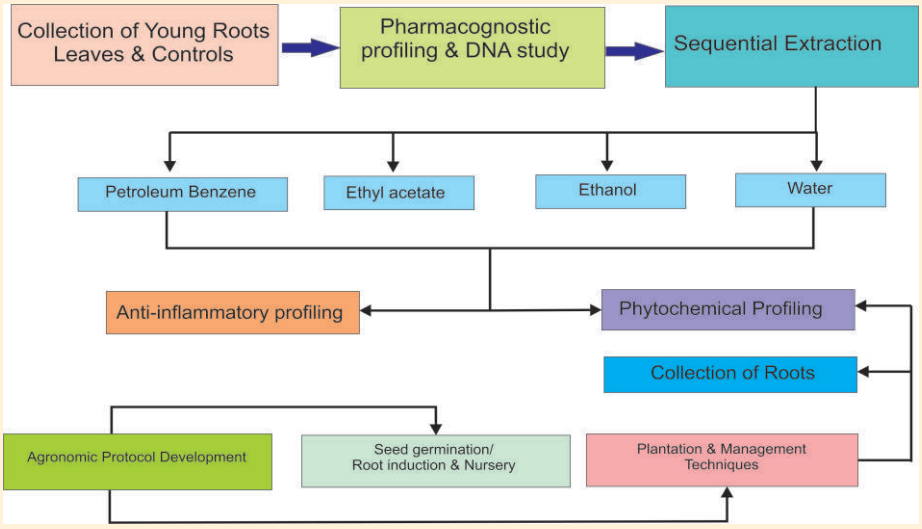
The experts reviewing the entire proposal emphasised the need for samples from multiple sources and also to study the alternative species for *Syonaka* and *Agnimantha* viz. *Ailanthus excelsa* and *Premna serratifolia* respectively.

Source of Samples & Sample Collection:

Samples are collected from three different sources:
(I) NMPB aided project areas (ii) State Forest Research & Development sites (iii) Special private production. A total of 179 samples were collected from seven states viz. Gujarat, Maharashtra, Chhattisgarh, Andhra Pradesh, Haryana, Odisha and Karnataka; 5 samples were also collected from the markets.

Two age regimes were followed for sampling of young roots. For fast growing species i.e., *Gmelina arborea,*

Scheme - 1



Scheme of investigation

Oroxylum indicum, Ailanthus excelsa and Stereospermum chelonoides were collected at 6, 12 & 18 months age from each site. Sampling was done at 12, 18, 24 and 36 months for slow growing species *(Aegle marmelos, Premna serratifolia & Clerodendrum phlomidis).* Duration of nursery cycle was excluded for determination of age. Leaves of all species were also collected for the study as suggested by experts. Control samples of *Brihat panchmoola* species (stem bark and root bark) have been sourced from at least one of the sampling site.

Studies on Biological activities was conducted for these samples. Along with these pharmacognostic, genetic, physico-chemical and phyto-chemical evaluations were also carried out. (Refer Scheme -1)

Vital biometric data was recorded for each of the sampling cycle and at each sampling site. (Refer table - 2)

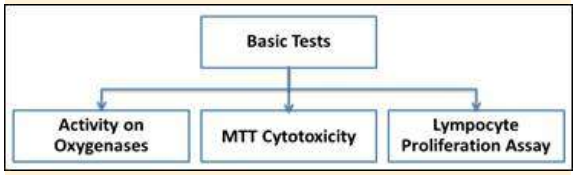
Table - 2 Morphological parameters of *Oroxylum indicum* saplings in different population of India

Age	Site	Parameters				
		Plant height (cm)	Stem circumference (cm)	Root length (cm)	Root circumference (cm)	No. of Branches
6 Months	Sambalpur	142	4.2	64	10.7	7
	Pakhal	196	5.3	45.8	8.5	-
12 Months	Umarpada	142	-	75	-	-
	Nashik	50	-	35	4	-
	Sambalpur	150	9.2	36	13	-
	Bolangir	120	11	31	14.5	5
	Pakhal	226.58	12.21	45.67	15.46	0
18 Months	Umarpada	134	9	74	8.5	-
	Nashik	75	-	40	6	-
	Sambalpur	110	5.5	34	6	3
	Pakhal		14.33	50.2	18.8	0

Studies on Biological Activity:

The extracts prepared at DRDC were provided to the study partner, the School of Life Sciences, University of Hyderabad for anti-inflammatory profiling. The following scheme was used for this purpose. (Refer scheme - 2)

Scheme - 2



Scheme for Assessment of Biological Activity

Study Outcomes:

The observations made on anti-inflammatory profile of the study sample were taken as the basis of sample selection. The following criteria were considered to determine the anti-inflammatory profile of the sample.

1) Selective inhibition of COX-2 and/or 5-LOX
2) Without visible adverse effects on cell viability (in MTT Cytotoxicity assay) or Lymphocytes proliferation
3) At least, 50% inhibition of pro-inflammatory cytokines
4) 2 fold increase in anti-inflammatory cytokine IL-2

Conclusions and Future Course:

The project sets an appropriate direction to address the concerns associated with the *Brihat panchamoola* group. The observations established the hypothesis to a great extent. As a part of project deliverables the agronomic protocols for high density short term scheme for production of young roots was also completed satisfactorily for 3 species. While working on similar package of practices for *Premna serratifolia* scaleup studies were initiated for production of *Oroxylum indicum* roots.

More importantly, replacement of stem barks with young roots requires a regulatory nod. Unless the API publishes pharmacopoeia monographs, the process shall not have any regulatory sanctity. In this context, young roots deserved an attention that:

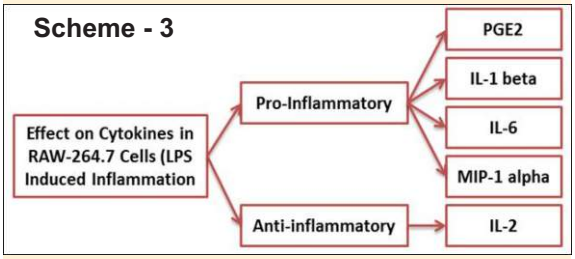
- Use of young roots complies with the
- Sanskrit nomenclature of *Brihat panchamoola.*
- A process for their continuous production for pharmaceutical consumption can be ensured leading to sustainability of resources

Oroxylum indicum

Stereospermum chelonoides

Gmelina arborea

Therefore these observations need a careful examination by regulatory authorities and may suggest any further course of activities to strengthen the study outcomes.



Scheme for Effect of Cytokines

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Premna integrifolia crop at Melachur, AP.

Oroxylum indicum at nursery ready for transplantation

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Table - 3 Species and Observations related to Biological activity studies

***Bilva: Aegle marmelos* (L.) Correa**
- Root bark exhibits potent COX-2 inhibition activity. Stem bark and market samples didn't exhibit such activity. On further examination root bark inhibited only IL1b and induced IL-2.
- 2 year old roots from Gujarat and Odisha also have similar levels of inhibition. Further, these samples effectively inhibited all the pro-inflammatory cytokines i.e. IL-1β, IL-6 and MIP-1α while promoting the expression of IL-2.
- 2 years old roots can effectively substitute the use of root bark

***Agnimantha: Clerodendrum phlomidis* L.f. & *Premna serratifolia* L.**
- In case of *Laghu Agnimantha* extraction of root bark was not technically possible. Only mature roots & stem bark were collected as reference samples.
- Market samples of this species largely comprised stem cuttings.
- Stem bark exhibited visible anti - inflammatory profile against all criteria. An equivalent biological activity was observed in 3 years old roots (Gujarat source).
- On the other hand, Stem bark of *Premna* species didn't qualify for COX-2 inhibition activity for further screening.
- However, young roots exhibited dual effect of being COX-2 & 5-LOX inhibition. I year and 1.5 Year old roots of Karnataka origin have shown distinct advantage over stem bark of the same species
- *P. serratifolia* gives the advantage of early harvesting cycles in relation to the *C. phlomidis* for similar degree of biological activity

***Syonaka: Oroxylum indicum* (L.) Kurz and *Ailanthus excelsa* Roxb.**
- Stem bark of *A. excelsa* and root and stem barks of *O. indicum* exhibited potent COX-2 inhibition. However, these extracts didn't show any visible effect on cytokines expression.
- The 1 year old roots of *A. exclesa* also inhibited COX-2 but had no effect on cytokine expressions.
- 6 months old roots (Odisha origin) and 1 year old roots (Gujarat origin) and leaves of *O. indicum* have exhibited a comprehensive anti-inflammatory profile as against the root or stem bark.

***Patala: Stereospermum chelonoidis* (L.f.) DC. [Syn. *S. suaveolens* (Roxb.) DC.]**
- Root bark of *Patala* inhibited the COX-2. Its effect on expression of IL-1b and IL-2 are also marked.
- Equally good anti-inflammatory profile was noted with 18 months old roots of *Patala* (Gujarat origin)

***Gambhari: Gmelina arborea* Roxb.**
- Stem bark of *Gambhari* was observed inhibit COX-2 and pro-inflammatory cytokines. The extracts also promoted expression of IL-2.
- An equally good anti-inflammatory profile was seen with 18 months old roots (from Odisha) 6 months old roots (Chhattisgarh origin).

Hearty Congratulations for receiving prestigious life time award!!

On 8/11/2014, National Medicinal Plants Board, Department of AYUSH, Go.I's conferred a Life Time Award titled: Lifetime's Service for Conservation of Medicinal Plants, to Mr. D. K. Ved, I.F.S. (Retd.) Former Director and Advisor, FRLHT and Dr. G. S. Goraya, I.F.S. Deputy Director General, I.C.F.R.E., Go.I. and Former Joint Director, FRLHT, Bangalore. Their more than 2 decades of passionate and committed work towards Conservation of Medicinal Plants is respected and regarded.

Outreach Activities of FRLH Herbarium, Bangalore

3rd to 14th November 2014: Training programme on "Taxonomy, Plant Identification and Herbarium Techniques" was designed and conducted for 3rd B.Sc., CBP, Sri Dharmasthala Manjunatheshwara College, Ujire, Dakshina Kannada.

16th & 17th June 2014: Training programme on Herbarium techniques and plant identification was conducted on for Dravyaguna students of Sri Sri College of Ayurvedic Science & Research.

6th January 2015: One-day Orientation programme on Anatomy of medicinal plants was conducted for 14 students and two professors of B.Sc., CBZ and CBBT, VI Semester from Maharani Lakshmi Ammanni College for Women, Malleswaram, Bangalore.

5th May to 30th May, 2014: Two students of II B.Sc. (CBZ) from St. Joseph's College of Arts and Science, Bangalore, undertook an internship at FRLH Herbarium.

Reported by: Dr. Noorunnisa Begum, Senior Programme Officer, FRLHT. Email id: *noorunnisa.begum@frlht.org*

Services offered at FRLH Herbarium, Bangalore

- Authentication of medicinal plants/raw drug samples
- Preparation of Floristic inventories through surveys
- Design tailor made training programs in plant identification & Herbarium Techniques
- Provide technical support to establish Herbarium and Raw Drug repositories
- Area specific pictorial field guides
- Undertake floristic studies/ Ethnobotanical studies of a specific region

Email us at :*k.ravikumar@frlht.org/noorunnisa.begum@frlht.org*

Building a cadre of Village Botanist/ Para taxonomist

The Centre for Conservation of Natural Resources, at FRLHT, Bangalore has designed a structured "Village Botanists Course" for village youths to hone their skills in identification and documentation of biodiversity components including medicinal plants which helps in conservation. So far, a cadre of 350 'Para taxonomists' (Village Botanists) in 11 states across India has been trained. FRLHT with the support of National Biodiversity Authority (NBA) and State Biodiversity Board organised skilled based training programme for the village youth on Identification and documentation of biodiversity components during 2014-15 in selected states namely Andhra Pradesh, Gujarat, Himachal Pradesh, Sikkim and West Bengal.

23rd to 31st March 2014: Manipur Village Botanist Programme at Imphal

5th March 2015: Village Botanist participants from Andhra Pradesh observing Tamarind Groove Biodiversity Heritage site near Devenahalli, Bangalore

For more details about the training programme contact:
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Neighbourhood Medicinal Plants of Bangalore

CDROM for High School Students

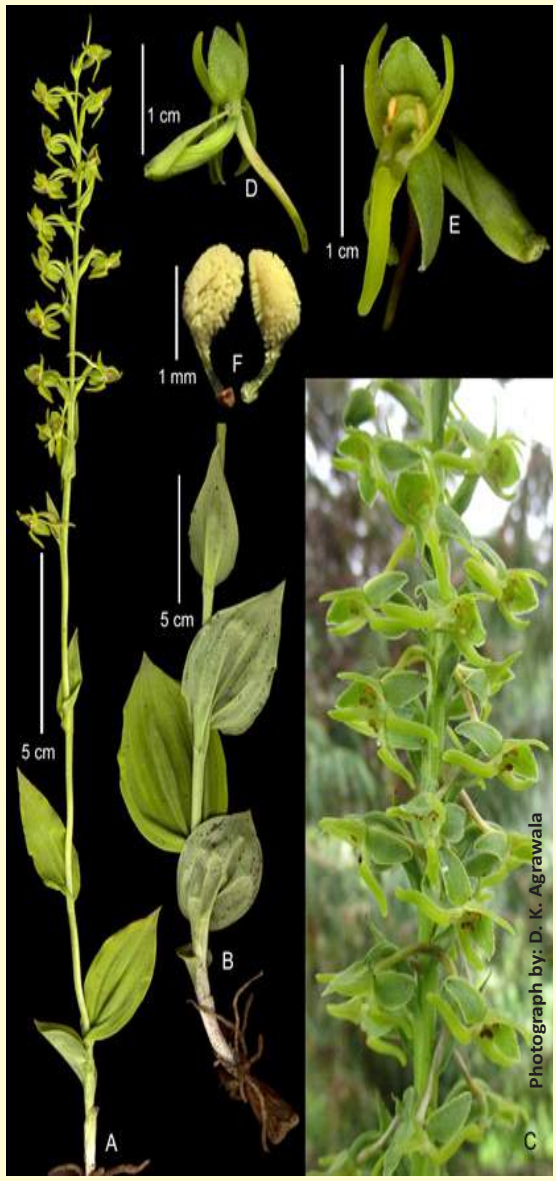
Now, Bangalore city students can use the new CDROM, to explore your fascinating plant world. Experience the richness of plant diversity in your traditions, life style and environment. Share with us your interesting and enriching learnings in a creative way(such as poems, essays, paintings etc. Best expressions will be published in our website : *www.envis.frlht.org*. Email:*envis@frlht.org* or send your entries by post.

Conservation Status of Ashtavarga Drug .....

It is a tuberous, terrestrial orchid having short aerial life span. The dormant tubers give rise to aerial shoot on the onset of monsoon, complete the phenology and enter again into dormancy during winter. Being an orchid, it possesses microscopic seeds devoid of endosperms and its germination highly depends on the availability of suitable mycorrhiza (with which it associates symbiotically for supply of nutrients) in the soil. Further, being an insect pollinated species, fruit setting highly depend on availability of pollinators. Therefore, this species is much sensitive to its micro-environment and does not proliferate much in the nature.

This species is generally distributed in the sub-temperate to Alpine Himalayan region extending from Pakistan to Arunachal Pradesh through N. W. Himalaya, Nepal, Sikkim and Bhutan. Though widely known and exploited for its medicinal tubers in N. W. Himalaya, its use and commercial trade in Sikkim has not been observed. This can be attributed to the lack of awareness among the local inhabitants about its botanical identity, medicinal properties and trade value. Because of the natural reproductive barriers, complex life cycle and habitat specificity, this species is found in sporadic patches at Sikkim Himalaya. Its habitats are subjected to other threats like landslides, urbanization, development of roads, live-stock grazing etc. Because these threats are prevailing since long time and becoming severe in the recent past, its population reduction during last 10 years can be suspected/ estimated to be 30 – 50 %. Personal field observation at various sites of Sikkim during 2007 – 2015 revealed the presence of 6 sub-populations at and around Lachen, Lachung, Katao, Phamthang, Sada and Maenam Wildlife Sanctuary.

Sikkim, with a geographical area of 7096 km^2 is too small for application of criteria B of IUCN (geographical range of distribution as EOO and AOO) for assessment of its threat status at regional context. Further, no organized study on its population reduction has been conducted during last 10 years for application of criteria A1. By applying criteria A2cd the threat status of this species in Sikkim Himalaya can be assessed as Vulnerable. Although, habitat of this species is continuous with the neighbouring areas and the microscopic seeds can be easily dispersed through air in those areas (which allow to downgrade the threat assessment to next lower category i.e. Least Concern in this case); but considering the complex life cycle, reproductive barrier, habitat specificity and potential for commercial exploitation, its threat assessment is kept unchanged at this time. If, immediate conservation measures are not initiated to reverse the cause of threats or to stabilize the population size, it may soon become endangered and even move towards extinction in its natural habitat.



Platanthera edgeworthii (Hook.f. ex Collett) R.K. Gupta

A. habit; B. basal portion of plant showing variation in leaves; C. inflorescence (not to scale); D. flower (lateral view); E. flower (front view); F. pollinaria. *Source: DKA 37855 (BSHC)*.

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Medicinal Plant Species of Conservation Concern identified in Jammu & Kashmir

CAMP workshops were held during 1998 at Kullu and 2003 at Shimla to assess the threat status of prioritised Medicinal Plants of Jammu & Kashmir. During this process, 62 species were assigned the status of Near Threatened (NT) and above.

Of these 62 species, 18 species have a global Red List (RL) status as these are endemic (or nearly so) to the state/region. 9 species have been assigned Critically Endangered (CR) status, 22 species are Endangered (EN), 28 species are Vulnerable (VU) and 3 species are Near Threatened (NT). 17 of these RL medicinal plant species have been recorded in high volume trade, as per the national level trade study. (2005-06)*

Critically Endangered:

1 *Aconitum chasmanthum* Stapf ex Holmes
2 *Aconitum heterophyllum* Wall. ex Royle
3 *Arnebia benthamii* (Wall. ex G.Don) Johns
4 *Betula utilis* D.Don
5 *Dactylorhiza hatagirea* (D.Don) Soo
6 *Gentiana kurroo Royle*
7 *Lilium polyphyllum* D.Don ex Royle
8 *Saussurea costus* (Falc.) Lipsch.
9 *Swertia chirayita* (Roxb. ex Flem.) Karst.

Endangered

1 *Aconitum deinorrhizum* Stapf
2 *Angelica glauca* Edgew.
3 *Arnebia euchroma* (Royle) John.
4 *Atropa acuminate* Royle ex Lindl.
5 *Balanophora involucrate* Hook.f.
6 *Bunium persicum* (Boiss.) Fedts.
7 *Cinnamomum tamala* (Buch.-Ham.) Nees
8 *Datisca cannabina* L.
9 *Didymocarpus pedicillata* R. Br.
10 *Dioscorea deltoidea Wall*. ex Griseli
11 *Ephedra gerardiana* Wall. ex Stapf.
12 *Fritillaria roylei* Hook.
13 *Habenaria intermedia* D.Don
14 *Juniperus polycarpos* C. Koch.
15 *Jurinea dolomiaea* Boiss.
16 *Litsea glutinosa* (Lour.) Robinson
17 *Meconopis aculeata* Royle
18 *Paris polyphylla* Sm.
19 *Picrorhiza kurrooa* Royle ex Benth.
20 *Podophyllum hexandrum* Royle
21 *Rheum emodi* Wall. ex Meissn.
22 *Taxus wallichiana* Zucc.

Betula utilis

Arnebia benthamii

Malaxis muscifera

Vulnerable:

1 *Aconitum violaceum* Jacq. ex Stapf
2 *Allium stracheyi* Baker
3 *Artemisia maritim*a L.
4 *Bergenia stracheyi* (Hook.f. & Thoms.) Engl.
5 *Ceropegia bulbosa* Roxb.
6 *Colchicum luteum* Baker
7 *Embelia tsjeriam-cottam* (Roem. & Schult.) A. DC.
8 *Eremostachys superba* Royle ex Benth.
9 *Ferula jaeschkeana* Vatke
10 *Gloriosa superba* L.
11 *Heracleum lanatum* Michx.
12 *Hippophae rhamnoides* L.
13 *Hyoscyamus niger* L.
14 *Hypericum perforatum* L.
15 *Physochlaenia praealta* (Walp.) Miers.
16 *Polygonatum multiflorum* (L.) All.
17 *Polygonatum verticillatum* (L.) All.
18 *Rauvolfia serpentina* (L.) Benth. ex Kurz
19 *Rheum moorcroftianum* Royle
20 *Rheum spiciforme* Royle
21 *Rheum webbianum* Royle
22 *Rhodiola heterodonta* (Hook.f. & Thoms.) Boriss
23 *Rhododendron anthopogon* D.Don
24 *Rhododendron campanulatum* D.Don
25 *Roylea cinerea* (D. Don) Baillon
26 *Saussurea obvallata* (DC.) Edgew.
27 *Valeriana jatamansi* Jones
28 *Zanthoxylum armatum* DC.

Near Threatened:

1 *Malaxis muscifera* (Lindl.) Kuntze
2 *Rhodondendron lepidotum* Wall. ex D.Don
3 *Saussurea gossypiphora* D.Don

* D. K. Ved & G. S. Goraya (2008). Demand & Suply of Medicinal Plants in India. Bishen singh Mahendra Pal Singh, Dehradun & FRLHT, Bangalore

Aconitum heterophyllum

Gentiana kurroo

Fritillaria roylei

Prioritization of Wild Medicinal Plant Species of Sikkim for Informed Conservation Action

D. K. Ved and Suma T. S.

The ever expanding domestic and global demand for herbal products has put the wild and native medicinal plant resources under substantial stress. Wild populations of many medicinal plant species, those growing inside the forests as well as outside forests, have depleted to such an extent that their very survival has become a cause of concern. Whereas, several of these species are facing threat on account of their narrow distribution (endemism) and degradation of their specific habitat, many of these have declined rapidly due to indiscriminate and unsustainable harvesting on account of high industrial demand. Even allied species/substitute species are also facing such threats. There are no management protocols existing for the wild species growing outside the forests, whereas management focus in respect of the species occurring in the forest has been primarily on the timber species of high commercial value with little attention to the management of wild medicinal plants. This lack of management focus, has been a cause, as well as a consequence, of inadequacy of data related to the diversity of medicinal plant species being harvested and the quantum of such harvests.

The Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore, a Centre of Excellence of Medicinal Plants and Traditional Knowledge of MoEF & CC of GOI, has initiated efforts to identify and prioritize wild medicinal plant species needing urgent management attention over the last two decade.

One such efforts relates to coordinating rapid threat assessment exercises for the wild medicinal plant species occurring in different states through Conservation Assessment and Management Prioritization (CAMP) workshops using IUCN Red List Categories and Criteria. During this period FRLHT has facilitated 14 such CAMP workshops covering 17 states of India. These exercises have involved undertaking assessments for a total of 359 prioritized wild Medicinal plant taxa. Of the 359 taxa taken up for assessment, 335 have been assigned Red List status ranging from Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) to Near Threatened (NT).

Another such effort relates to the NMPB sponsored nation-wide study to assess the demand and supply of medicinal plants in the country which was undertaken during 2006-07. A total of 960 medicinal plant species, identified as sources of 1289 botanical raw drugs, were recorded in trade in this study. Further scrutiny and analysis of this list resulted in short-listing of 178 species in high trade i.e. in volumes exceeding 100 MT (dry wt.) per year.

Out of the list of 335 Red Listed medicinal plant species resulting from the 14 CAMP processes, 197 were recorded in trade also (D. K. Ved and G. S. Goraya, 2008). These included 84 red listed species recorded in high volume trade i.e. exceeding 100 MT/year (dry wt.).

Camp Workshop for Sikkim State:

In 2014, FRLHT joined hands with Sikkim State Medicinal Plants Board (SMPB), who in turn was supported by NMPB, GoI, for conducting a CAMP process during workshop during September to November 2014 with the following expected outcomes:

1. Prioritization of wild medicinal plant species of Sikkim for guiding conservation action at the state level through Conservation Assessment and Management Prioritization workshop using IUCN Red List Categories and Criteria.

Focused group discussion with various stake holders during CAMP

2. Identification and enlistment of specific locations harboring wild populations of medicinal plants of Conservation Concern thus facilitating informed conservation efforts.

Precursor for this CAMP workshop, was the data obtained from the earlier CAMP conducted in 2003, for medicinal plants of North East Indian States of Arunachal Pradesh, Assam, Meghalaya and Sikkim at Guwahati. There were 34 Indian participants, who attended the workshop. However, the wild medicinal plants species of Sikkim state could not be assessed in detail on account of the limited participation of experts from Sikkim. Hence, from the list of 51 candidates, only 24 species were designated with IUCN categories (Kindly refer to volume 5, 2011-12, Medplant). 18% of the species were given Data Deficient tag (DD) for Sikkim and these included *Brucea mollis*, *Cinnamomum tamala*, *Drosera peltata*, *Elaeocarpus sphaericus*, *Embelia ribes*, *Flickingeria fugax*, *Garcinia pedunculata*, *Gentiana quadrifaria*, *Polygonatum verticillatum*, *Tropidia curculigoides*. This was largely on account of inadequate data related to population trends, though their wild presence is known recorded within the state. About 33% were assigned as Not Evaluated (NE) species on account of unconfirmed wild populations in the state. These included: *Cibotium barometz*, *Gynocardia odorata*, *Panax wangianus* and *Rauvolfia serpentina*. This was on account of inadequate field observations available amongst the participants as experts. Due to this limiting factor, there was no recommendation for conservation action for State Forest Department.

CAMP Workshop Process, 2014:

A Pre-CAMP workshop (11th- 12th September 2014) followed by CAMP workshop (17th to 19th November 2014) was coordinated by Foundation for Revitalisation of Local Health Traditions, Bangalore, organized by Sikkim State Medicinal Plants Board, and State Forest Department. Botanical experts, field botanists, IUCN Medicinal Plants Specialist Group members (IUCN MPSG), local forest department staffs, students, healers, researchers, SMPB officers were actively engaged from inception of the process till threat assessment.

During PRE-CAMP process, the participants were oriented towards IUCN RedList Categories & Criteria and the methodology for rapid threat assessment after systematic short listing of candidate species. Literature research and consultation with experts to confirm the wild presence of selected species in Sikkim and its distribution, trade as well as propagation etc were compiled. A total of 126 potential candidate species including species of the earlier CAMP (2003) were listed.

Final CAMP Exercise (November 2014):

Final CAMP exercise was organized for three days, where participants further prioritized the species by revisiting the 126 list. They short listed 49 potential candidates for assessment. Subsequently, 68 participants were divided into 5 sub-groups, and species was assigned depending on the expertise and field observation data. Each group composed of a Facilitator, Taxon Data Sheet Recorder and Field Experts. Each of these groups, further discussed about their assigned species with regard to its occurrence in wild (Extent of Occurrence, Area of Occupancy, locations, population reduction trend, generations and regenerations) plus trade aspects and taxonomic clarifications. Taxon Data Sheets (TDS) were systematically filled. At the end of each day, in plenary session, TDS was discussed. End of third day, the threat status for the species discussed was assigned applying IUCN criteria. Totally 49 species were identified for Sikkim State as provided in the table 1.

Group Discussion

Out of 49 species, *Panax sokpaiyensis* Shiva K. Sharma & Pandit, which is endemic to Sikkim Himalayas has been assessed as Endangered (Global) on account of its endemic status.

CAMP report is being finalized in consultation with experts. This will be soon released for guiding resource managers and researchers to focus their action research programs for specific species and locations through establishment of *in-situ* conservation sites like Medicinal Plants Conservation Areas (MPCAs). Along with these appropriate resource augmentation measures, have to be developed for conservation of wild genetic resources.

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Table - 1 Conservation Concern Species of Sikkim, CAMP 2014

Species Name	IUCN Status*	Number of species
Panax sokpaiyensis Shiva K.Sharma & Pandit	EN (G)	1
Allium wallichii Kunth, *Fraxinus floribunda* Wall, *Saussurea obvallata* (DC.) Edgew and *Swertia chirayita* (Roxb. ex Flem.) Karst.	EN (R)	4
Aconitum ferox Wall. ex Seringe, *Bergenia purpurascens* (Hook.f.& Thomson) Engl., *Cordyceps sinensis* (Berk.) Sacc. [= *Ophiocordyceps sinensis*], *Dioscorea deltoidea* Wall. ex Griseb., *Ephedra gerardiana*, *Flickingeria fugax* (Rchb.f.) Seidenf., *Fritillaria cirrhosa* D.Don, *Gymnadenia orchidis* Lindl., *Hippophae salicifolia* D.Don, *Hodgsonia heteroclita* (Roxb.) Hook. f. & Thoms., *Jurinea macrocephala* DC., *Litsea citrata* Blume (synonym) *Litsea cubeba* (Lour.) Pers. (accepted name) *Malaxis acuminata* D.Don, , *Malaxis muscifera* (Lindl.) Kuntze, *Nardostachys jatamansi* (D. Don) DC., *Neopicrorhiza scrophulariiflora* (Pennell) D.Y.Hong, *Panax bipinnatifidus* Seem., *Paris polyphylla* Smith, *Platanthera edgeworthii* (Hook. f. ex Collett) R.K. Gupta, *Podophyllum hexandrum* Royle , *Polygonatum cirrhifolium* (Wall.) Royle, *Polygonatum verticillatum* (L.) All., *Rhododendron anthopogon* D. Don, *Saussurea gossypiphora* D.Don, *Valeriana jatamansi* Jones and *Zanthoxylum acanthopodium* DC.	VU (R)	26
Berberis aristata DC., *Betula utilis* D. Don, *Juniperus recurva* Buch.-Ham. ex D. Don, *Mahonia napaulensis* DC., *Meconopsis horridula* Hook. f. & Thomson, *Meconopsis paniculata* (D. Don) Prain, *Oroxylum indicum* (L.) Kurz, *Rheum nobile* Hook.f. & Thoms., and *Roscoea purpurea* Sm.	NT (R)	9
Campylandra aurantiaca Baker , *Docynia indica* (Wall.) Decne., *Hedychium spicatum* Smith, *Heracleum wallichii* DC. and *Thalictrum foliolosum* DC.	LC (R)	5
Curcuma augustifolia Roxb., *Podophyllum sikkimense* R.Chatterjee & Mukerjee, *Trillium govanianum* Wall. ex D.Don, and *Valeriana hardwickii* Wall.	DD (R)	4

*VU- Vulnerable, NT- Near Threatened, LC- Least Concern, EN- Endangered (G)-Global(Endemic), DD- Data Deficient (R)-Regional, (G) -Global

Salacia chinensis L. – Utility and Propagation Techniques

Ankur Patwardhan[1,2]*, Makarand Pimputkar[1], Radhika Joshi [1]

Medicinal Plant Wealth of Western Ghats Mountains (a global biodiversity hot-spot) in India are becoming globally significant to newfound curative properties. *Salacia chinensis* L. is one of the elements of these mountains. *Salacinol* and related compounds from this species are used in the treatment of diabetes. Destructive harvesting of *Salacia* roots has resulted in population decline (> 50 %) in the last decade. Assessment for anti-diabetic activity of alternative plant parts such as stems, seeds, leaves is one approach to develop sustainable harvest strategy. Reducing harvest pressure on wild population and developing viable commercial cultivation that caters ever increasing demand of raw material by the pharmaceutical industry is a huge challenge. Systematic approach should be made towards scientific cultivation of *Salacia*. Present write up discusses investigations of seed germination and the factors affecting the same.

Flowering twig

About *Salacia chinensis* L.: *Salacia chinensis* L.[Synonym- *Salacia prinoides* (Willd.) DC.], family - Celastraceae is an evergreen climbing shrub or a small tree occurring in India, Sri Lanka, China, Malaysia, Java and Philippines. It occurs in pockets mainly around the Sahyadri – Konkan corridor area of the northern Western Ghats. It is locally referred as *Saptarangi, Ekanayakam*, *Ponkoranti*, *Saptachakri* or *Ingali*. *S. chinensis* has gained importance as a rich repository of chemical constituents contributing to various medicinal properties. Phytochemical profiling reveals the presence of constituents such as *salacinol*, *kotalanol*, *neokotalanol* and *mangiferin*. Though extracts of *S. chinensis* exhibit medicinal activity against tumors, mutagenicity, hepatitis, arthritis, cardiac disorders and mental disorders, traditional medicinal systems have restricted use of *Salacia* primarily as an anti-diabetic agent.

Diabetes Management:

International Diabetes Federation (IDF) predicted the growth of diabetic patients from 366 million in 2011 to 552 million in 2030. It is also known that management of type 2 diabetes by insulin therapy results in insulin resistance, anorexia nervosa, brain atrophy and fatty liver during chronic treatments. In contrast, the use of *Salacia* under prescribed dosage is considered completely safe. As a result, demand for raw material of *Salacia* (*S. chinensis* L., *S. oblonga* Wall., *S. reticulate* Wight) has witnessed a steep increase and it currently exceeds 100 metric tons per year. About 95 % supply coming from the wild populations of Western Ghats. Presently, only the roots are exploited for their medicinal properties, making the harvesting destructive. Combination of these two threats have necessitated the need to scientifically study various propagation techniques of the species.

Morphological characters:

Outer side of the root has a golden yellow cork layer whereas the inner side has several pink-red concentric rings of bark and wood tissue. The leaves are thinly coriaceous with 1.75 - 3.5 cm in length, 1 - 1.5 cm in width, elliptical, serrate, acute, opposite to sub opposite. Flowers are yellow, 1.25 cm in diameter, 3- 6 individuals from small tubercles in the axils of leaves. Fruits of *Salacia chinensis* L. are green when unripe and turn red upon ripening. They are edible, berry type - usually solitary. They are sub-globose to ellipsoid and are about 13 – 23 mm in diameter. Fruit pulp is mucilaginous. Average seed weight is 0.48 g ± 0.08 g. Seeds are brown in colour. They are large, occupying almost 90% of the fruit. Most of the fruits bear only one seed each. Only about 2 % fruits have double seeds.

Propagation Trials:

Though in field, lateral roots of *Salacia* are seen to develop into independent individuals, efforts were focused on propagation through seeds. Fruits were de-pulped and the fresh seeds were sown in germination trays. To study the effect of storage on germination, some seeds were stored in vermiculite to maintain moisture at room temperature and were subsequently sown at fortnightly interval.

Observations Related to Germination:

When fresh seeds were sown immediately after harvesting and de-pulping, the germination started within 45 – 50 days and 50 % germination was achieved in next fortnight. Upto 7 months of storage of seeds in vermiculite, the germination percentage was more than 90. Thus, the seeds are orthodox. Considering this high germination percentage, no further experimentations were carried out about seed soaking and/or gibberellic acid dip. As the storage time increased beyond 7 months, there was a significant decrease in the germination percentage (50 - 60 %).

It was also observed that 4 % seedlings were conjointed doublet type, whereas 2 % seedlings were conjointed triplet type. We also encountered 0.04 % albino individuals suggesting feeble homozygous nature within the seedlings.

Average days required for germination were influenced significantly by number of days of storage of seeds prior to sowing (r^2 = 0.9781, *p* value < 0.05). More the days of storage, more were the days required for germination. Though there was a negative correlation between the average days required for germination and fresh seed weight (r^2 = 0.5537), dry seed weight (r^2 = 0.8499) and seed moisture (r^2 = 0.8447), the correlation was statistically not

significant (p value > 0.05). Similarly, seed dry weight and seed moisture content were negatively correlated with days required for 50% germination (r^2 = 0.8394, p value < 0.05 and r^2 = 0.8447, p value < 0.05; respectively).

Observations Related to Relative Humidity:

To study the effect of relative humidity on germination, 100 seeds were sown in a humidity chamber (relative humidity= 80 - 90 %) and other set of 100 seeds was sown outside the humidity chamber (relative humidity = 35 - 50 %). Seeds in humidity chamber required much lesser period for first germination (35 days) and for 50 % germination (52 days) as compared to performance of the seed set sown outside the humidity chamber (53 and 100 days, respectively).

Treatment of Seedlings with Manures:

The seedlings thus obtained were transplanted into nursery bags. Different treatments of organic manures (poultry, vermicompost), inorganic fertilizers (urea, di-ammonium phosphate, Suphala), microbial source [phosphate solubilizing bacteria (PSB)], foliar sprays of enzymes (biozyme), micro-nutrients (Rexolin) and growth hormones (gibberellic acid) were tried to establish the best amongst the lot. Benefits of adding cocopeat to the basic potting mixture of soil and farm yard manure were also evaluated. Evaluations were carried out by comparing biomass and Dickson Quality Index (DQI).


Ripened fruits


Root showing concentric rings

Addition of cocopeat improved performance of almost all the additives. Probably, increase in the porosity due to cocopeat addition allowed roots to grow more profusely, thereby increasing the nutrient uptake and increasing the biomass. In potting mixtures without cocopeat, biomass of all the treatments did not differ significantly than control - seedlings without any additives (p value > 0.05). However, almost all the treatments for seedlings from nursery bags with cocopeat had better biomass than their control counterpart. Here, mean seedling biomass of seedlings obtained from sets receiving Rexolin foliar spray (one tail p value = 0.006), biozyme foliar spray (one tail p value = 0.025), gibberellic acid foliar spray (one tail p value = 0.014) and PSB soil application (one tail p value = 0.011) were significantly more than the mean biomass of control.

In the set of experiments having no cocopeat in potting mixture, DQI of only the seedlings receiving urea was better than control (p value > 0.05, statistically not significant) while others had mean DQI values equal to or less than mean value of control. In the other case of potting mixture having cocopeat, though DQI of seedlings receiving urea, Rexolin, biozyme and gibberellic acid had higher values than control, the differences were statistically not significant (p value > 0.05). DQI on only PSB treatment was significantly more than DQI of control (one tail p value = 0.024).

Recommendations:

Thus, we recommend seed sowing with minimum time period of storage. If the storage is inevitable, precautions should be taken to store them in vermiculite, thereby maintaining seed moisture content. Seed sowing in humidity chamber further improves germination performance. To ensure better DQI and more biomass, cocopeat should be added to the potting mixture. Foliar sprays of micronutrients, enzymes and growth hormones and soil application of phosophate solubilizing bacteria improved health of the seedling.

Seedlings thus obtained can be transplanted into larger nursery bags at least once after 6 months of first transplanting and after a year from first transplanting; they may be planted into field at a distance of 2 ft × 2 ft for intense cultivation.

Systematic cultivation of *Salacia chinensis* L. shall result in quality planting material QPM and shall allow pharmaceutical industry an assured, authentic supply without endangering the wild population.

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Guggulu – The Precious Medicinal Plant

K. V. Billore

Guggul is an important medicinal plant of the herbal heritage of India. The Sanskrit name *Guggulu* is well known in Ayurveda, particularly the pill "*Mahayograj Guggul*", an effective drug for rheumatism is popular, besides other reputed preparations. The question arises what is *Guggul*? *Guggul* is an exudation in the form of gum oleoresin derived from the plant *Commiphora wightii* (Arn.) Bhand. It is a plant of arid areas commonly known as "Indian bdellium" or *Guggal/ Guggul*. *Guggul* is used since vedic period as incense and as fumigation for insecticidal action which is one of the methods of treatment in Ayurveda. The great saints *Charaka* and *Sushruta* used the drug *Guggul* about 5000 years ago as main ingredient in various formulations.

The gum oleoresin is used in the treatment of rheumatism, obesity, cardiovascular, neurological and other disorders. It also has anti-inflammatory, anti- rheumatic and hypocholesterolemic/ hypolipaemic activity. It is also a rich source of steroids, which may find use as an alternative raw material for the synthesis of corticosteroid drugs such as dexamethasone and betamethasone. A preparation by name "Guglip" developed from *Guggul* by the Central Drug Research Institute, Lucknow is reported to possess hypolipidemic activity equivalent to that of Clofibrate the present drug of choice. Clofibrate is being discontinued and phased out in the USA on account of its toxic manifestations. Therefore, there is ample scope for introducing Guglip on a commercial scale, which is a *Guggul* product.

Taxonomy and Distribution:

The genus *Commiphora* is represented in India by five species i.e. *C. wightii* (Arn.) Bhand., *C. berryi* (Arn.) Engl., *C. caudata* (W.& A.) Engl., *C.agallocha* Engl. [syn:*C. madagascariensis* Jacq.], *C. pubescens* Engl. [syn:*C. caudate* var. *pubescens* (Wight & Arn.) K. M. Matthew] and *C. stocksiana* Engl. Of these *C. berryi* and *C. pubescens* occur in southern India. The report of *C. berryi* from Madhya Pradesh and *C. wightii* from Karnataka is erroneous. The name *Balsamodendron mukul* and *Commiphora mukul* are synonymous to the present correct and valid name of *Guggul* i.e. *Commiphora wightii*. The gum oleoresin of *Commiphora wightii*, the "Indian Bdellium" is the main commercial source of "*Guggulu*".

Commiphora wightii is seen growing on both rocky and sandy soil in extremely arid and semi-arid tracts of Rajasthan and Gujarat, besides some parts of Maharashtra and Madhya Pradesh. In Rajashtan, it is widely distributed across all districts and Aravali hills. It is closely associated with *Euphorbia neriifolia* L., *Gymnosporia montana* (Roth) Benth., *Grewia tenax* (Forssk.) Fiori. [syn: *G. populifolia* Vahl.], *Ziziphus nummularia* (Burm. f.) Wight & Arn., *Rhus mysorensis* G. Don etc. In Gujarat, it is distributed across the state particularly along the western districts and in Kutch and Bhuj areas. In Maharashtra, it is naturally occurring in the north eastern border including Melghat. In Madhya Pradesh, it is distributed along the bordering districts of Rajasthan. It may be mentioned that based on the survey conducted by the author i.e. during 1970s-1980s, *Guggul* was abundantly available in Rajasthan. During that time, the traders used to collect quintals of *Guggul* gum in a day, but today they hardly get 5 - 10 kg. This plant is depleted in wild, due to overexploitation, loss of habitat etc.

Striking Features:

Guggul, is a shrub/ small tree growing upto to 2 - 4 m high with crooked and knotty branches ending into sharp spines. The papery greyish bark peels in flakes from older parts of the stem. Young shoots are pubescent and glandular. The leaves are trifoliate with rhomboid/ ovate leaflets. The flowers are minute, maroon or reddish-brown and sessile. Fruits are ovoid drupes measuring upto 6 - 8 mm in diameter, greenish to reddish on ripening. The gum oleoresin is present in the ducts in the soft stem bark and also in larger veins of the leaf.

The gum oleoresin exudes as golden-yellowish milky juice , which solidifies on exposure. It is fragrant. *Guggul* is vermicular or stalactitic piece, pale yellow or brown in colour. It also occurs in rounded or irregular pieces or in masses of agglomerated tears. It has an agreeable aromatic or balsamic odour and aromatic bitter taste. It is a mixture of 61 % of resin and 29.3 % gum in addition to 6.1 % water, 0.6 % volatile oil and 3.2 % foreign matter, besides one 1.45 % of essential oil having chief components of essential oil like 64 % myrcene, 11 % dimyrcene and some polymyrcene. The GLC of oil showed the presence of 19 components.

Commiphora wightii twig

Extraction of *Guggul* gum – Tapping:

The *Guggul* gum is extracted from the plant by making 0.5 - 1 cm deep mild incisions, horizontal or at 60^{0} on the trunk (7 cm diameter) bark, during December to February, using some inducing agent like *Guggul* gum paste, acid or some chemicals (Copper Sulpate), horse or wild ass urine. While giving an incision the edge of the knife is dipped in the solution of the inducing agent and small cut / incision (2.5 - 4 cm long) is given on the bark of a mature tree (over 7 yr. old). The gum exudes after 10 to 15 days and maximum exudation is observed in hot summer. The lumps of the gum

are collected, dried and stored. On an average 200 to 700 g gum is collected in a season from a well grown tree. A good quality gum is translucent and free from the debris, bark and soil / sand etc.

Conservation/ Cultivation:

Guggul was once abundantly seen. But today, due to habitat loss, over exploitation and unscientific methods of tapping gum using H_2SO_4 has led to population decline. This has made it a rare and a threatened a species. It is therefore essential to conserve this important medicinal plant both by *ex-situ* & *in-situ* means.

Tapping gum from plant

Guggul gum

Pioneering efforts have been made by the government of Rajasthan in 1969 by acquiring 50 acres of forest land near Mangliawas village for conservation and cultivation of *Guggul* though establishment of *Guggul* Herbal Farm Mangliawas (Ajmer District) for production of saplings and cuttings. More serious conservation efforts for *Guggul* started during seventies (1972) with the establishments of the then Regional Research Institute (Ayurveda), Jaipur, under the aegis of Central Council for Research in Ayurvedic Sciences (CCRAS), New Delhi under Ministry of AYUSH Government of India. The Council took keen interest in re-organizing the farm and about 90 acres of adjoining forest land was acquired. The *Guggul* herbal farm is now having 140 acres of land. The farm is located on hilly terrain about 5 km away from the village Mangliawas on the National high way No. 10. The entire required infrastructure for cultivation practices for *Guggul* was made available both for propagation and experimental studies. Over 15,000 plants of various age groups of *Guggul* are planted in the farm. This farm is the first conservatory of *Guggul* in India. This farm is now transferred to the National Institute of Ayurveda, Jaipur. Central Arid Zone Research (CAZRI), Jodhpur, besides some other colleges and institutions have initiated studies on conservation of *Guggul*.

In Gujarat considerable efforts have been made to conserve *Guggul* by the Anand Agricultural University. Large scale plantations of *Guggul* were undertaken in the Kutch and Bhuj areas. Gujarat Ayurved University has also taken up studies on the species.

In recent times, *Guggul* has been introduced successfully for cultivation in the non- habitat area of Osmanabad District in Maharashtra under the aegis of the Maharashtra Medicinal Plants Board, Pune (NMPB schemes). The production of gum oleoresin is yet to be explored because it is outside their natural environment.

The situation as far as availability of *Guggul* for meeting the demand of the pharmacies is blurred. Presently, the gum is imported from other countries including (Pakistan), to meet the demand of the pharmacies of the country for production of life saving drugs. There is an urgent need on the part of National Medicinal Plants Board, Central Institute for Medicinal and Aromatic Plants, Lucknow and other reputed non-government organizations locally and regionally has to join hands and work together to develop scientific and safe tapping technique of gum and encourage cultivation and conservation of *Guggul*.

About the author:

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Whats in news?

FRLHT visitors of 2014- 2015 who were oriented towards ENVIS Centre activities

1. **13th February 2015:** Late Kedari Redekar Ayurvedic Mahavidyalaya, Kolhapur (35 students)
2. **12th February 2015:** St. Joseph's Post Graduate Centre, Bangalore (18 students)
3. **5th February 2015:** Gujarat Ayurved University, Jamnagar (20 students)
4. **29th January 2015:** R. V. College of Architecture, Bangalore (52 students)
5. **23rd January 2015:** Srimad Andavan Arts and Science College, Tiruchirappalli (32 students)
6. **9th January 2015:** Baduku Community College, Bangalore (15 students)
7. **11th December 2014:** Government College of Pharmacy, Bangalore (25 students)
8. **5th December 2014:** Society for Community Health Awareness Research and Action [SOCHARA], Bangalore (18 trainees)
9. **28th November 2014:** University of Horticultural Sciences, Bagalkot (65 students)
10. **27th November 2014:** Range Forest Officers' trainees from Central Academy for State Forest Service, Coimbatore. (35 trainees)
11. **24th November 2014:** S. H. E. S. Ayurvedic Medical College, Gulbarga (40 students)
12. **11th November 2014:** Mallya Aditi International School, Bangalore (14 students)
13. **26th September 2014:** Visit by students from Presidency school, Bangalore
14. **15th September 2014:** Biodiversity Management Committees trainees, selected by the State Biodiversity Board, Sikkim during Village Botanist at FRLHT, Bangalore
15. **6th August 2014:** Azim Premji University, Bangalore (22 students)
16. **4th August 2014:** Vaidyaratnam Ayurvedic College, Ollur (36 students)
17. **17th July 2014:** Senior members from All India Women Congress, New Delhi (3 members)
18. **15th July 2014:** Invited talk was delivered to the senior officials of All India Women Congress. (40 officials)
19. **14th July 2014:** Poornapragna School, Bangalore (80 students)
20. **10th July 2014:** Team of Doctors and housewives from Bangalore Urban
21. **30th April 2014:** State Forest Department officials of Sikkim State Medicinal Plants Board were given orientation

Reported by: Mr. Sumukha K. V., Senior Adminsitative Assistant, FRLHT and Ms. Revathi R., Office Assistant, FRLHT, Bangalore

Wild Edible Fruits: The Health Tonics of Kashmir Himalayas

Om Prakash Vidyarthi Sharma

Wild fruits of diverse kinds have remained popular among ethnic communities. Edible use of wild fruits especially the lesser known ones like horse chestnut, with hawthorn, blue berry, wild plums, balsam, buckthorns etc., are diminishing, due to urbanization and commercial cultivation of more familiar horticultural fruits like apples, cherries, peaches, guavas, bananas, pomegranates, sapotas, melons, watermelons, litchis, mangoes etc. Jammu Shivaliks and Temperate hills have diverse wild fruits known for their nutraceutical and medicinal value. In this write-up, author shares his experiences on the wild edible fruits of Kashmir Himalayas which are potential market and medicinal value.

1. **Horse Chestnut** [*Aesculus indica* (Wall. ex Cambess.) Hook. Family: Sapindaceae]: Locally called *Guggu* or *Goon* in Dogri and *Handun* in Kashmiri is wild walnut of Hangul so named *Handun* as *Dun* in Kashmiri means walnut. These fruits serve as famine food. Fruits are collected prior to famine days and made into fine powder for preparing Rotis (Indian bread). Fruit are used to cure stomach upsets in cattle and horses.

2. **Blue Barberry** [*Berberis lycium* Royle; Family: Berberidaceae]: Locally called as *Kaimblu* or *Simblu*. Blue fruits mature during monsoon months and are edible. Yellow Roots (Rasaunt) of the plant are used to heal wounds and liver tonics. Fruits of this plant have potential as local drink.

3. **Wild Hawthorn or Thorn Apple** [*Crataegus songarica* K. Koch syn. *Crataegus oxyacantha* L.; Family: Rosaceae]: Locally called *Paindak* in Dogri, *Kishtwari* and *Ringa* in Kashmiri Gojri, A beautiful spiny tree with lobed leaves bearing orange red edible fruits of great therapeutic value. These fruits are recommended for heart patients. Ripened fruits are rich in tannins and flavonoids and are apple flavored. These are fondly eaten by birds and wildlife too. These can be used in preparation of jams, jellies and wines too. In Mughal Gardens of Kashmir, these plants are used as landscape elements.

4. **Seabuckthorn, Wild Silver Cherry/ Oleaster fruit** [*Elaeagnus latifolia* L.; Family: Elaeagnaceae]: Locally it is called *Ban Kanak* or *Kankoli* in Dogri. It is seen growing in Poonch Rajouri Katra, Billawar, Dudu, Sudhmahandev, Batote. Fruits appear like wheat grain and also of the same size. Fruits are rich in antioxidants and minerals and eaten during monsoon season. Indian Institute of Integrative Medicine (IIIM), Jammu, has initiated research for further improvement in its qualities of fruits for future marketing.

5. **Punjab Fig and Eve's Fig** [*Ficus palmata* Forssk.; Family: Moraceae]: Locally called *Phakada* or *Phagoda* is delicious and nutritive rich wild fruit like edible fig of commerce. Allied Eve's Fig, *Ficus auriculata* Lour. called *Trimbal* or *Timal* is large sized wild fig with more attractive bright pink fruits. This is particularly collected by natives and eaten as such or made into jams and jellies. Unripe figs are cooked as vegetable as well. They are used in treating lung disorders. (FRLHT Database)

6. **Governor's Plum** [*Flacourtia indica* (Burm.f.) Merr.; Family Salicaceae]: Locally named as *Kakoha* in Dogri and *Vikankat* in Sanskrit. It grows in subtropical Kandi belt of Jammu Heavily armed tree's wood employed as wild tea substitute in places like Sangaldan, Katra Tikri, Billawar Ramnagar, Samba Heeranagar, Akhnoor Sunderbani. Yellowish red fruits under the name Kakohey, were once sold in old Jammu city and sub-urban areas during summers. This practice is almost lost and local uses are declining to an extent. This plant has horticulture significance. More delicious Lovilovi fruit, can be grafted on wild Kakoha trees or seedless varieties of wild Kakoha developed under National Horticultural Mission, to popularize it among Mata Vaishno Devi pilgrims. The decoctions from the fruits are used as digestive enzymes and in treating enlarged spleen. (FRLHT Database).

7. **Balsam** [Impatiens *glandulifera* Royle & *Impatiens thomsonii* Hook.f.; Family: Balsaminaceae]: Locally called *Teera* or *Tru*. Fruits are turgid capsules, which breaks open

Aesculus indica

Berberis lycium

Crataegus songarica

and explode with a slight touch, and therefore called 'Touch me not'. While on a pilgrimage to Machail temple in Paddar area of Kishtwar, Ponywala communities pluck these balsam fruits delicately and consume the nutritive small seeds for instant energy. This gets rid of fatigue, while climbing mountain. Plants are also used as Heena or Mahendi by rural women folk.

8. **Box Myrtle** [*Myrica esculenta* Buch.- Ham. ex D. Don syn. *Myrica nagi* Thunb.; Family: Myricaceae]: Locally called *Kapphal* or *Kupphal,* is another lesser known wild tree with edible stony fruits usually seen on sale in many Himalayan hill stations like Dalhousie, Shimla, Nainital. In Jammu, Kaphal tree is seen in wild only a few locations like Kardoh nala on way to Bani in Billawar forests and Chod Motu near Samnabanj in Ramnagar forests. The different preparations of fruits are used to treat stomach ache, dysentery, also in reducing fever. (FRLHT Database)

9. **Yellow & Black Raspberry** [*Rubus ellipticus* Sm.; Family: Rosaceae]: *Aakhre* or *Aakhe* in Dogri or *Peela Hinsalu* or *Gauri Phal* in Hindi. Fruiting seen during April-May. They look like miniature strawberries, an Etaerio of achenes. In one of the local legend, it is told that a Kashmiri girl fond of eating yellow raspberries (*Aakhe*) got married to Punjabi . She yearned to eat those juicy fruits in her in-laws place. But she could not find them in Punjab plains, as it does not grow. After her death, poor woman in the disguise of Cuckoo sings a sad notes which sound as- *Aakhe paake mei neyi chakhe, Piyoke bhejo Piyoke bhejo.* Thus the local legend associated with the wild fruit directly relates to short winged Himalayan Cuckoo (*Cuculus micropterus* Gould) as *Piyoke bhejo*. The note also means can I send you Cuckoo to mom's home to fetch the delicious fruits. Time immemorial, in folk practices these seasonal fruits are part of local delicacies. They are mostly offered to guests, visitors, pilgrims by natives at places like Kali dhar, Sunderbani, Sudh Mahandev, Mansar, Kalounta, Maungri Basnot etc. This fruit can be promoted widely as local seasonal health drink and will have local market too. Along with these fruits, Black Raspberry (*Rubus fruticosus* L. or *R. niveus* Thunb.) growing in temperate mountains of Jammu & Kashmir are tasty fruits which can be added to ice creams. The tender parts of the plants such as roots and stem are used in treating stomach ache, head ache and giddiness. (FRLHT Database)

10. **Himalayan Yew** [*Taxuswallichiana* Zucc.; Family: Taxaceae]: Dioecious conifer with traditional usage of bark as Barmi cha in Jammu & Kashmir. It is now known for anti-cancerous drug *Pacilitaxel* obtained from foliage and bark. Scarlet red fleshy arils of seeds are safe to consume by humans and birds. Vegetative multiplication trials are in progress. But large scale plantations are awaited. The needles are used in asthma, bronchitis, high cough, epilepsy and for indigestion. (FRLHT Database)

In our local health traditions lesser known wild fruits have been used not just as delicacy, but as food, nutrient supplements, medicine. These important bio-resources have to be conserved by appreciating its importance in our lifestyle plus encourage people to use it and look at alternative health drinks locally. Economically important fruits maybe identified for large scale production and utilization. Traditional knowledge accumulated by earlier ethnic communities need to be improved upon and added more value with modern scientific agro-techniques and innovative biotechnology to generate small scale wild fruit processing units at select tourist places frequently visited by visitors, pilgrims and tourists.

About the author:
Dr. O. P. Sharma, I.F.S, APCCF Central, PCCF Head office, Van Bhawan Jammu till April end; May to October Sheikhbagh, Srinagar, Kashmir. Email id: *opsfrijk@gmail.com*

Conservation Education and Training Programme

29-30th April 2014: Conservation Education Training Team at FRLHT designed and conducted 2 days orientation training on Medicinal Plants Conservation and MPCAs for Senior Officers of State Medicinal Plants Board and State Forest Department, Sikkim. These participants were taken to visit Savanadurga Medicinal Plants Conservation Area, Karnataka to appreciate the management intervention for conservation concern species like *Decalepis hamiltonii* in its natural habitat.

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Email: *bs.somashekar@frlht.org*

Ficus palmata

Rubus ellipticus

Taxus wallichiana

The Spiny *Goksura*

Shilpa Naveen

Meaning of the name:
The word *Goksura* means the 'hoof of a cow'. So it can be presumed that it is something divided into 2 like a cows hooves. The name also suggests that fruits are armed with spines, which injure the feet of grazing cattle.

There are 43 Sanskrit synonyms pertaining to *Goksura* across various classical texts, 118 bibliographical citations and around 50 such references for the term "*Goksuraka*". This is probably as *Goksura* and *Goksuraka* are two different plants.

***Goksura* and *Dashamoola*:**
This plant is one of the key ingredients of *Dashamoola* group of drugs. It is included in hundreds of Ayurvedic formulations such as *Dashamoola arista*, *asava*, *ghrita* and *Dashamoola rasayana*. All the 10 drugs in *Dashamoola* group are mostly sweet in taste and post digestion, neither very hot nor cold in potency, mitigates all *doshas*, especially more useful in *"Vata"* vatic disorders like nervous system problems. It is one of the *Rasayana Dravya's* (rejuvenative drugs) prescribed in Ayurveda. It is considered as one of the best drugs to relieve pain, burning sensation, and dysuria.

Botanical Correlations:
Based on close examination of classical names and its botanical correlations in various scholarly works and comparison with raw drugs from market and original collections, the following list is prepared.

1. ***Tribulus terrestris* L.** (traditionally the fruit of this plant is used as *Goksura* in Kerala; as the fruits are smaller in size it is known as *Laghu Goksura*)
2. ***Pedalium murex* L.** (in this plant the diuretic property is ascribed to the mucilage contained in the plant body; the fruit is larger than that of *Tribulus* and hence the name *Brihat Goksura*)
3. ***Xanthium strumarium* L.** (Morphologically it has features mentioned as that in the ancient texts; it is a poisonous plant but the toxic substances are easily removed by cooking)

Tribulus terrestris is the most correlated species with regard to features of synonyms mentioned for *Goksura*. It is popularly used as diuretic while *Pedalium murex* is correlated to *Brihat Goksura* (larger variety) and recommended as aphrodisiac, tonic and nervine tonic.

Properties of *Goksura* based on classical texts:
गोक्षुरो मधुरो वृष्यो दीपनो बलपुष्टिकृत्
शीतलो वस्तिवातघ्नो दोषत्रयनिबर्हणः
हृद्रोगमेहकृच्छ्राश्मश्वासकासरुजाहर (*Kaideva Nighantu*)

Goksura is *madhura* in *rasa* (sweet in taste), *vrsya* (aphrodisiac), *dipana* (appetizer), *bala-pusti kara* (strengthening and nourishing), *sitala* (cold in potency), *tridosha hara* (alleviates vitiation of all the three *doshas*), alleviates diseases like *hrdroga* (cardiac disorders), *meha* (diabetes), *krcchra* (dysuria), *ashma* (urinary calculus), *svasa* (dyspnoea), *kasa* (cough), *ruja* (pain).

Tribulus terrestris fruit

Simple Home Remedies of *Goksura*

Dysuria
Prepare a decoction using ½ cup of *Goksura* boiled in 4 cups of water, reduced to 1 cup. After cooling, consume in a dose of 40-60 ml by adding 1 tsp of honey, twice a day for 3-4 days. *(Bhavaprakasa Nighantu, Madhyama khanda,* 8.36/30)

Rheumatoid arthritis/Lumbago (low back pain)
Ginger and *Goksura* should be chopped into pieces and pounded well; ½ cup of this is boiled in 4 cups of water, reduced to 1 cup and filtered. This should be administered in a dose of 40-60 ml twice a day on empty stomach (*Cakradatta,* 25/9)

About the author:
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Simple Tips to Boost Your Immunity

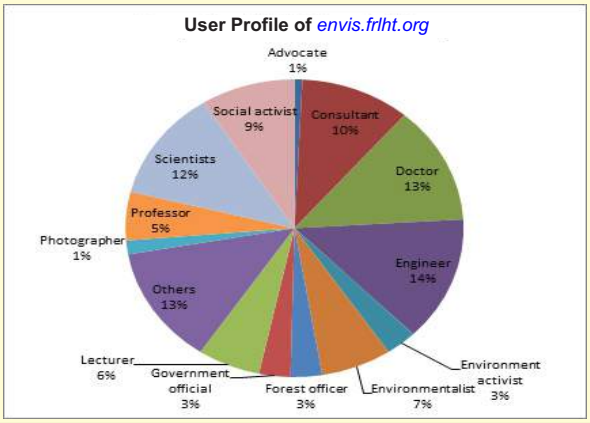
Ayurveda emphasizes on building up ones immunity. This branch of medicine promotes the intake of special herbs to increase the immunity level of the people. Moreover the herbs are used to relieve swine flu symptoms and boost the immune system against the H1N1 virus.

***Guduci* (*Tinospora cordifolia* (Willd.) Miers)**
Fever/intermittent fever: crush the whole plant of *Guduci* to extract juice. It should be administered internally in a dose of 20 ml thrice a day (*Caraka Samhita, Cikitsa sthana,* 3/299)

***Yastimadhu* (*Glycyrrhiza glabra* L.)**
Rejuvenative: Well dried *Yastimadhu* should be crushed to make a fine powder and sieved through a fine cloth. It should be taken in a dose of 5 g twice daily after food. It acts as a rejuvenative (*Caraka Samhita, Cikitsa sthana*, 1.3/30)

***Asvagandha* (*Withania somnifera* (L.) Dunal)**
To improve immunity: well dried *Asvagandha* should be crushed to make a fine powder and sieved through a fine cloth. It should be taken in a dose of 5- 10 g twice daily along with warm water (*Astanga sangraha, Uttara sthana*, 49/390)

Website Users Profile (2014-15)



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Explore a well referenced, unique one-stop-information house on medicinal plants of India. This exclusively website gives information on conservation concern species, traded species, latest reports/ publications/ directories. User friendly search, enables us to access range of information related to botanical and local names correlations, view digital atlas and digital herbarium!

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Jul-14	999861	843287	676884	72928	35
Aug-14	844593	716111	516902	69831	59
Sep-14	781297	626125	469099	94814	56
Oct-14	761219	591881	466998	97274	51
Nov-14	973073	740420	606226	103842	61
Dec-14	985481	805379	607715	82654	52
Jan-15	962072	803158	563566	57994	45
Feb-15	824427	709036	446175	43008	55
Mar-15	888094	760561	480722	42561	41
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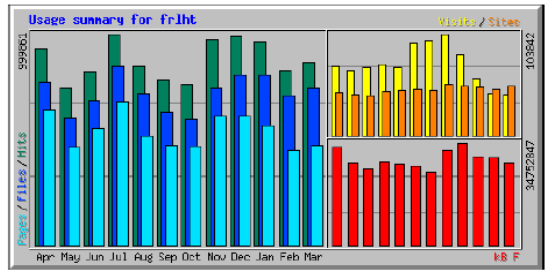

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	Total records	Uploaded in 2014-15 after curation
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Vernacular names in 12 languages	119183	
Geographical distribution maps	1971	98
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Colourful plant images	2088	201
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Total number of visitors 2014-15: 48744

Online Inventory of Medicinal and Aromatic Plants of Sikkim

http://envis.frlht.org/sikkim/

New App!

Neighbourhood Medicinal Plants of Bangalore City

https://play.google.com/store/apps/details?id=frlht.neighbmpblrcity

Centre of Excellence on Medicinal Plants; FRLHT-MoEF & CC, GoI

Annual Reports

Available as free download - *http://envis.frlht.org/coe.php*

http://frlhtenvis.nic.in/WriteReadData/Publication/COE_Anuual

Awards and Recognitions

2014: Life time's Service award for Conservation of Medicinal Plants was conferred to Mr. D. K. Ved, I.F.S. (Retd.) Former Director and Advisor, FRLHT by NMPB, GoI on 08/11/2014

2013: FRLHT is also a Private University titled "Institute of Trans-Disciplinary Health Sciences and Technology", as per the special Issue of Karnataka Gazettee notification number: HFW 90 PTD 2013, Government of Karnataka; dated 26/06/2013.

2012: The 7th Nutra India summit conferred its Nutra Excellence Award 2012 to the Founder Director of FRLHT.

2011: The Rajagopal Rama Varier Memorial AVP Excellence award to the Founder, Shri Darshan Shankar 2011: Padma Shri awarded to the Founder, Shri. Darshan Shankar

2011: Designated as Bio-Resource Information Centre on Indian Medicinal Plants Database, D.B.T., Go.I

2010: Recognized as National R&D facility (Rasayana) by : Department of Science and Technology, GOI

2010: Indian Innovation Award, Indian Express (EMPI Group of Institutions)

2009: Recognized as a Center of Excellence in Indian Systems of Medicine by Dept. of AYUSH, Ministry of Health and Family Welfare

2009: Award for Proficiency in Clinical Application of Ayurveda Shastra from Vaidyaraj Datar Panchaboutik Chikitsa and Samshodhan Kendra, Sangli, Maharashtra

2008: Global Propagation of Ayurveda Award from the AVR Foundation, Coimbatore

2007: "The Green Institution Award", Better Interiors, Mumbai

2007: "Citizen Extra Ordinaire", Rotary Club, Bangalore

2003: Recognized as an organization engaged in Scientific and Industrial Research by the Dept. of Scientific and Industrial Research

2003: International Award for Leadership in Complementary & Alternative Medicine, Columbia University, New York

2002: Designated as Environmental Systems Centre on Medicinal Plants, Mo.E.F. & C.C., Go.I.

2002: Recognized as National Centre of Excellence, Ministry of Environment, Forests and Climate Chamge, GOI, Ministry of Health and Family Welfare, GOI

2002: Equator Initiative Prize of United Nations for Linking Conservation to Livelihood Needs of Rural Communities

1998: Norman Borlaug Award

International Day for Biological Diversity 2015
Biodiversity for Sustainable Development
https://www.cbd.int/idb/2015/

United Nations Decade on Biodiversity

This year's theme reflects the importance of efforts made at all levels to establish a set of Sustainable Development Goals (SDGs) as part of the United Nations Post-2015 Development Agenda for the period of 2015-2030 and the relevance of biodiversity for the achievement of sustainable development.

The selection of the theme also underlines the adoption of the Gangwon Declaration, by ministers and participants to the High-level Segment of the twelfth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD). The Gangwon Declaration welcomed the importance given to biodiversity in the outcome document of the Open Working Group on Sustainable Development Goals and called for the further integration and mainstreaming of biodiversity in the Post-2015 Development Agenda.

We invite Parties and organizations that have already initiated national plans for activities to celebrate the International Day for Biological Diversity to keep the Secretariat informed of such plans and other noteworthy activities organized by NGOs or other organizations so that they may be included in these pages.

Read the notification: *http://www.cbd.int/doc/notifications/2014/ntf-2014-137-idb-en.pdf*

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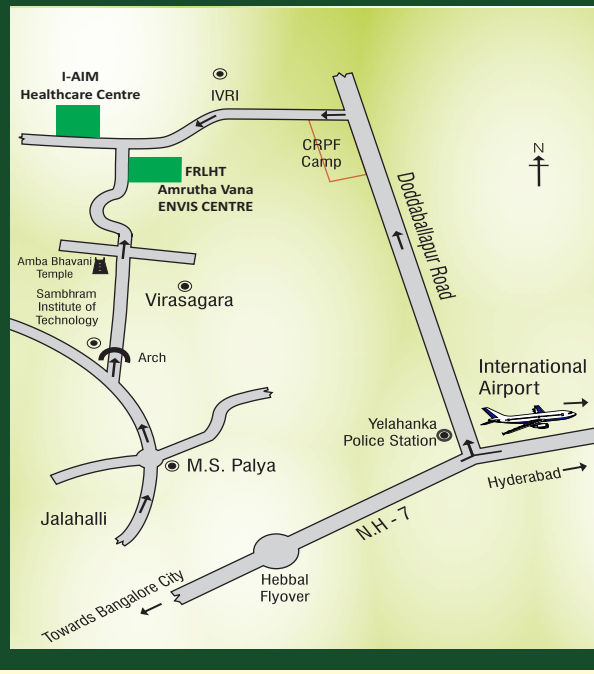

We invite readers to send their responses/views/features of interest etc. through e-mail: *envis@frlht.org* (Please note: Articles for subsequent issues should not exceed more than 1500 words. It can be accompanied with images in .jpg format)

For more information contact:

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