Medicinal Plant Research

• Cultivation/Demonstrative Gardens

Demonstrative cultivation programme of the Council is being carried out at 5 gardens at National Research Institute of Basic Ayurvedic Sciences, Pune (Maharashtra), National Vriksha Ayurveda Research Institute, Jhansi (Uttar Pradesh), Ayurveda Regional Research Institute, Itanagar (Arunachal Pradesh) and Regional Research Institute of Himalayan Flora, Tarikhet (Uttarakhand) and National Research Institute Sowa-Rigpa, Leh-Ladakh (Jammu & Kashmir).

No. of gardens under CCRAS **:** 5 (Pune, Ranikhet, Itanagar, Jhansi & Leh)

Area under cultivation **:** 68.5 Acres approx

In present total no. of plants under cultivation **:** 1127 (716 species)

No. of cultivated species represented in AFI, part-I & II : Approx. 200

Research paper published **:** 150

a) Significant achievements

- Standard method for propagation of Guggulu plant through cutting and air layering established.
- Plants being provided to Govt./NGO/Private Institutions and farmers.
- Cultivation techniques established on saffron.
- Know-how being given to Forest Department Govt. of Uttarakhand and other interested parties.

Experimental cultivation of many species are carried out to observe the quality and quantity of yield, suitable maturity time of the drug part and adaptability of the species to new habitat condition.

Monographs/Books Published:

1. Cultivation of *Commiphora wightii* (Guggulu)
2. Experimental cultivation of *Crocus sativus* L. (Kumkum)
3. Herbal Wealth of Uttarakhand, Vol-I

NATIONAL RESEARCH INSTITUTE OF BASIC AYURVEDIC SCIENCES, PUNE

The Institute has carried out its cultivation activities and maintenance of medicinal plants demonstrative garden from May, 1961 in about 19.5 acres land available for cultivation purpose. About 386 species, mostly of medicinal importance and a few of economic or ornamental value are presently being grown in the garden.

***Tinospora cordifolia* (Willd.) Miers. (Guduchi)**

REGIONAL RESEARCH INSTITUTE OF HIMALAYAN FLORA, RANIKHET

- The Herbal Garden was established in July 1972 at Ranikhet, located on a hillock, 1710 meter above msl and bounded by pine forest on its northern and western sites and cultivation project is confined to about 3.0 acres of the land. 156 medicinal plants cultivated mostly for demonstrative purposes. More than 80 research papers were published and one monograph on saffron. 200 germplasm of medicinal plants species were collected.

- The experimental cultivation of saffron (*Crocus sativus* L.) is being undertaken in selected land at Ranikhet at an altitude of 2000 m. Routine application of agro techniques and adaptable practices are carried out. Study and experiments, with the growth of corms and plants, yield of saffron was also undertaken. The present strength of the small, medium and developed corms is estimated as 15 thousands (approx.).

- "Van Aushadi Vatika" another garden is located in Chamma (Tehri) at an altitude of 1700m in Gharwal Himalaya. In this garden 94 medicinal plants are maintained along with the cultivation of Saffron.

Crocus sativus L.

AYURVEDA REGIONAL RESEARCH INSTITUTE, ITANAGAR

The medicinal plant garden was established in June, 1987 consisting of steep slopes and ditches. 11.5 acres of land is presently devoted to cultivation of medicinal plants. Total 206 species of plants of Ayurvedic importance are growing in the garden.

Embelia ribes **Burm.f. (Vidanga)**

NATIONAL VRIKSHA AYURVEDA RESEARCH INSTITUTE, JHANSI

The Regional Research Institute, Jhansi was established in the year 1983 has undertaken cultivation of important Ayurvedic medicinal plants both on experimental, and demonstrative purposes. Cultivation of medicinal plants programme is confined to about 10 acres of land. The Garden is maintaining a live collection of over 355 species of medicinal plants.

Uraria picta (Jacq.) Desv. ex DC.(Prisnaparni) grown at RRI (AY) Jhansi

NATIONAL RESEARCH INSTITUTE SOWA-RIGPA, LEH-LADAKH (JAMMU & KASHMIR)

Trans Himalayan herbal garden project was funded by National Medicinal Plant Board, New Delhi under the grant in aid scheme for herbal garden for the cultivation of various medicinal plants like Amlavetasa (*Hippophae rhamnoides* L.), Puṣkara (*Inula racemosa* Hook.f.), Ativiṣā (*Aconitum heterophyllum* Wall. ex Royle), Muñjātaka (*Dactylorhiza hatageria* (D.Don) Soo), Vanatrapuṣī (*Podophyllum hexandrum* Royle ex Camb.), *Medicago sativa* L., Kṛṣna Sarṣapa (*Brassica nigra* (L.) Koch), *Helianthus annuus* L., Pārasīka yavānī (*Hyoscyamus niger* L.) and tree species like *Prunus armeniaca* L., *Salix* and *Populus*. The area under cultivation is 24.7 acres and only 12 plant species are under cultivation.

Trans- Himalayan Herbal Garden

Muñjātaka (***Dactylorhiza hatagirea*** (D.Don) Soo)

In-vitro propagation studies

The Plant Tissue Culture Laboratory was established in 1989-1990 at National Research Institute of Basic Ayurvedic Sciences, Pune and was upgraded during 2008-2009.

Significant Achievements:

- **Protocol for *in-vitro* propagation completed & published:**

Sr. No.	Name of Plant	Subject of Published papers	Published in Journal/Seminar
1	**Kutaj –** *Hollarhena antidyasenterica* Wall.	*In-vitro* propagation of Kutaja **(***Holarrhena antidysenterica* Wall).	BMEBR, Vol. XIII, (3-4), 154-165, **1992**.
2	**Satavari –** *Asparagus racemosus* Willd.	*In-vitro* propagation of *Asparagus racemosus* Willd. (Satavari)	BMEBR, Vol.15, (1-4), 68-74, **1994**.
3	**Sariva** – *Hemidesmus indicus* R. Br.	Observation on *In vitro* propagation of *Hemidesmus indicus* R.Br. (Sariva)	BMEBR, Vol. 16 (3-4), 129-132, **1995**.
4	**Brahmi** – *Bacopa monnieri* (L.) Pennell	1) *In vitro* propagation of Brahmi (*Bacopa monnieri* (L.) Pennell.	BMEBR, Vol. 18 (3-4), 145-150, **1997**.
5	**Brahmi** – *Bacopa monnieri* (L.) Pennell	2) Observations on leaf culture of Brahmi – *Bacopa monnieri* (L.) Pennell	BMEBR, Vol. 21 (1-2), 46-52, **2000**.
6	**Shalparni** – *Desmodium gangeticum* (L.) DC.	1) Effect of various treatment on seed germination of *Desmodium gangeticum* (L.) DC. (Shalparni).	BMEBR, Vol. 20 (1 – 4), **1999**.
7	**Shalparni** – *Desmodium gangeticum* (L.) DC.	2) *In vitro* propagation of *Desmodium gangaticum* (L.) DC. From cotyledonary nodal explants.	PHCOG MAG, Vol.4, 145-150, **2009**.
8.	**Prasarini** – *Paederia foetida* L.	*In vitro* propagation of *Paederia foetida* Linn. through stem and leaf culture	BMEBR, Vol. 21 (1-2), 80-87, **2000**.
9	**Prishniparni** – *Uraria picta* (Jacq.) Desv. ex DC.	1)Effect of various treatment on seed germination of *Uraria picta* Desv. (Prishniparni),	BMEBR, Vol.22 (1-4), 60-68 (**2001**).
10	**Prishniparni** – *Uraria picta* (Jacq.) Desv. ex DC.	2) *In vitro* Propagation of the medicinal plant *Uraria picta* (Jacq.) Desv. ex DC. from cotyledonary node and nodal explants.	PHCOG MAG, Vol.4, S239-S245, **2008**.
11	**Patha** – *Cissampelos pariera* L.	*In vitro* propagation of Patha	JDRAS, Vol. 29 (1-2), 39-46, **2008**.

- **Protocol for *in-vitro* propagation completed & introduced to the field** : 4 species
  - **Banafsha** – *Viola serpens* Wall.
  - **Patha** – *Cissampelos pareira* L.
  - **Prishniparni**- *Uraria picta* (Jacq.) Desv. ex DC.
  - **Trivrit** - *Operculina turpethum* (L.) Silva Manso

- Protocol for *in-vitro* propagation completed but publication awaited on the following plants
  - **Trivrit** - *Operculina turpethum* Silva Manso,
  - **Shyonaka** – *Oroxylum indicum* (L.),
  - **Bharangi** - *Clerodendrum serratum* (Linn) Moon.,
  - **Manjishtha** - *Rubia cordifolia* Linn.

- Protocol partially completed: 4 Species
  - **Ishwari** - *Aristolochia indica* Linn.,
  - **Patala -** *Stereospermum straveolens* DC,
  - **Gambhari -** *Gmelina arborea*,
  - **Bilwa -** *Aegle marmelos* Corr.

Photography of *In-vitro* grown plants.

a. **b.** **c.** **d.**

e. **f.** **g.**

h. **i.** **j.**

Fig. Shows different stages of *in-vitro* grown plants , a. *Aristolochia bracteata* multiple shoots, b. *Aristolochia bracteata rooting,* c. *Gmelina arborea* shoots, d. *Gmelina arborea* callus, e. *Uraria picta* rooting, f. *Swertia chirata* multiple shoots, g. *Stereospermum suaveolens* node culture, h. *Swertia chirata* shoots, i. *Saraca asoca* node culture, j. *Aristolochia indica* multiple shoots.

- **Pharmacognosy**

The Council has been engaged in fixing macroscopic and microscopic standards for identification of a drug material based on detailed information on the habit and anatomical characters for crude drugs as well as its various substitutes and adulterants.

The pharmacognostical research units located at Bangalore and Kolkata has been carried out pharmacognostical investigation on **400 single drugs** since inception for establishing the botanical identify of the drug along with their substitutes and adulterants. The study includes detailed structural/microscopic examination of the plant together with study of active principals and chemical constituents.

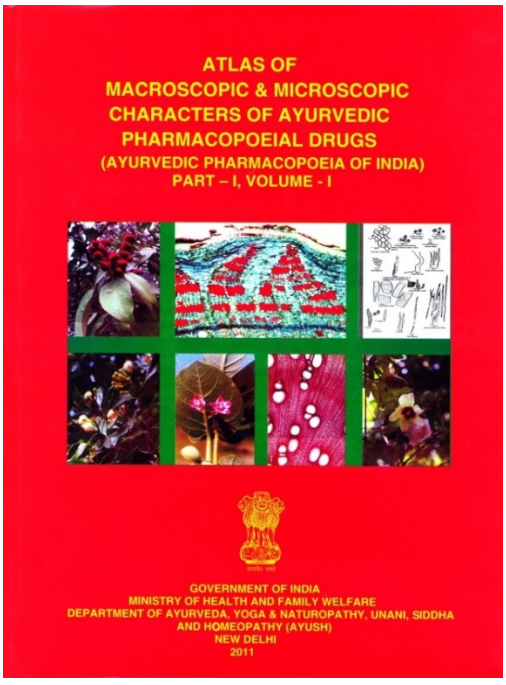
The study includes:

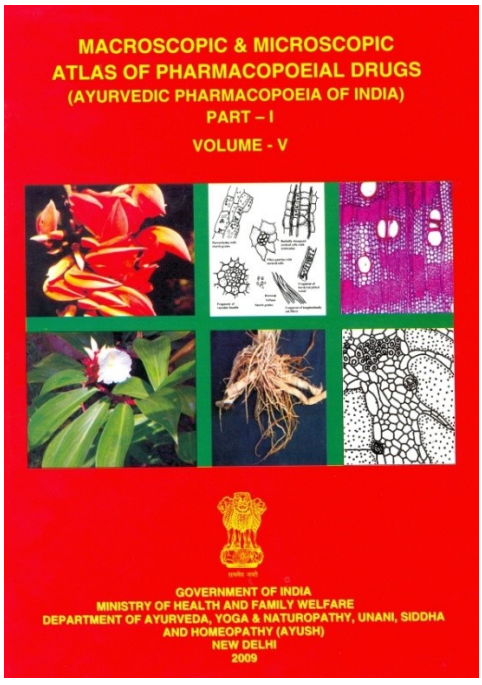
- Morphology & Microscopy of crude drugs including sensory characters.
- Cell contents & Powder study.
- Phyto-chemical and fluorescence analysis.
- Behaviour of drug/extract with different reagent/chemical.
- Physico-chemical constants like ash and extractive values.

Research Paper published **:** Approx. **300**

Monograph published:

- **Pharmacognosy of Indigenous Drug in 3 volumes.**
- Under **Ayurvedic Pharmacopoiea of India**, Deptt. Of AYUSH, 2 volumes of Macroscopic & Microscopic Atlas of Pharmacopoeial Drugs has been published: **API, Part-I, Vol-I and API, Vol-V.**





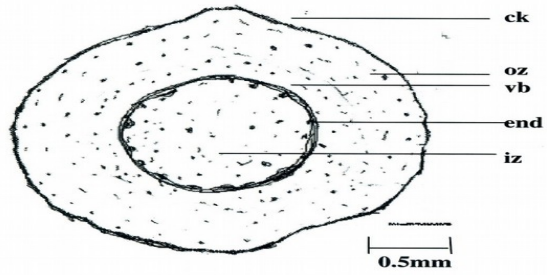
Haridra (Rhizome) ***Curcuma longa*** L.

Habit

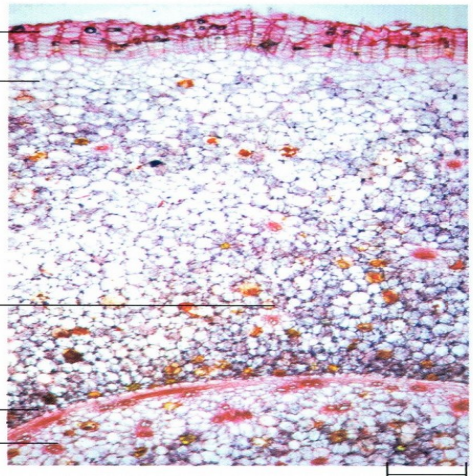
Dried processed rhizome

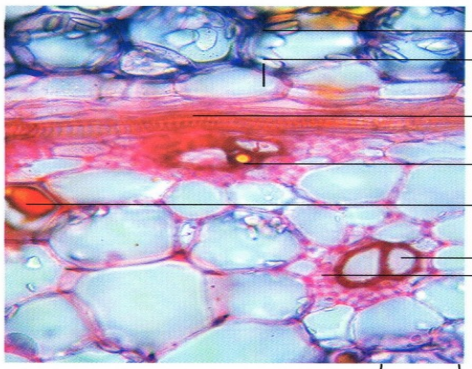
HARIDRĀ (Rhizome)
Curcuma longa L.

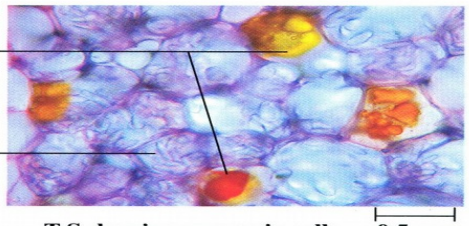
Microscopic characters



T S rhizome (diagrammatic)







Abbreviations:- cc, curcumin cell; ck, cork; end, endodermoid layer; iz, inner zone; ivb, inner vascular bundle; ovb, outer vascular bundle; oz, outer zone; ph, phloem; sg, starch grains; t, tracheid.

RESEARCH PROJECTS COMPLETED

1. Pharmacognostic and Preliminary Phytochemical Evaluation on selected Antidiabetic Medicinal Plants, with reference to its importance in Dietetic Preparations, Nutritional values, with Traditional uses.

ONGOING RESEARCH PROJECTS

1. Documentation of Folk healers and folk claims in the state of Assam and development of a database.
2. Compendium of Ayurveda Dietetics with reference to Cereals and Pulses.
3. Studies on Development of Agro Techniques of two important Medicinal Plants of Laghu panchmool.
4. Exploration, acclimatization and in vitro propagation of Medicinal Plants being used under the name Agnimantha
5. Rapd based DNA Fingerprinting to understand genetic variations and Phytochemical analysis of selected medicinal plants.
6. Selection of salt-tolerant cell lines and regeneration of salt tolerant plantlets of Prishniparni (Uraria picta (Jacq.) Desv) and Shalaparni (Desmodium gangeticum (L.) DC.
7. To establish the best procurement time for certain herbs by analyzing the seasonal variation in bioactive secondary metabolite with quantitative HPLC.
8. Cultivation of High valued Medicinal Plants in Medicinal Plants Garden.
9. Development of pharmacopoeial standards of traditionally Used Ayurvedic Formulations.
10. Documentation, critical analysis and interpretation of pharmacognostical data and parameters of single medicinal plants drugs from different published resources.
11. Pharmacognostical evaluation of medicinal plants cited in Ayurvedic formulary of India excluding the plants mentioned in Ayurvedic Pharmacopoeia of India