

Process technology for preparation of RTS beverage from *Rhododendron arboreum* flowers

Challenge/ Need : *Rhododendron arboreum* (Buransh) is a wild edible flower commonly found in the Western Himalayan region. Conventionally the flowers are consumed only during the blooming season and products are prepared from fresh flowers limiting their continued availability throughout the year. For enhanced value addition, CSIR-IHBT has standardized a process for the dehydration of the flower and developed a ready-to-serve (RTS) beverage using the dry flowers.



Technology USPs

- Low temperature dehydration retaining anthocyanins and colour value
- One serving (180-200 ml) of beverage provides not less than 300 mg anthocyanins (Cyanidin-3-O-glucoside equivalent)
- Shelf life of 9 months



Potential Beneficiaries: Women Self Help Groups, Farmers, and Entrepreneurs in the Food and Beverage Industry.

Process technology for commercial production of Millet Panjeeri

Challenge/ Need : Panjeeri is a traditional food consumed in the Western Himalayan region and is primarily prepared from wheat. With an increased demand for gluten-free foods and the use of millets in diet, developed a process for the preparation of panjeeri with millets as the primary ingredient.



**Bajra
Panjiri**

**Swank
Panjiri**

**Jowar
Panjiri**

Ragi Panjiri

Technology USPs:

- Gluten free (completely free from Wheat)
- Millet based
- No added preservatives and artificial additives
- Shelf life above 6 months

Potential Beneficiaries : *Entrepreneurs, SHG, Food Processing Industries*

Technology transferred to M/s Moon Foods, Tamil Nadu

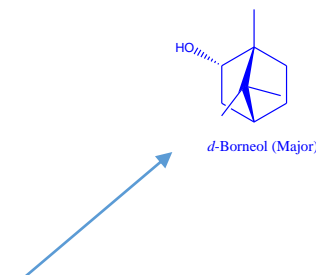
The process for the stereospecific conversion of camphor into borneol

Challenge/ Need:

Borneol, a natural medicine coming from essential oils, is a highly soluble bicyclic monoterpene, traditionally used to relieve anxiety, restlessness, and insomnia. It is a novel agent that improves drug delivery by enhancing blood-brain-barrier permeability and is used to improve consciousness in case of coma, heart attack, stroke, traumatic brain injury, and other brain-related emergency conditions.

Technology USPs

- No competing prior art is available in the market(Patents: US9068141B2, EP2690969A1)
- The final product is pharmaceutical grade and in crystalline form
- Synthetic green process (higher yield, effectively, efficiently, safely, and sustainably)converting stereospecific camphor into stereospecific borneol(~87%).



Borneol as major compound
(Borneol-86 %;
Isoborneol~13%
and Camphor- less than 1%)

Major crops: *Thymus satureioides*, *Cinnamomum burmannii*, *Dipterocarpus turbinatus*, *Blumea riparia* (L-80%).

Potential Beneficiary : Pharmaceutical Industry

Diagnostic Marker for True Cinnamon Identification

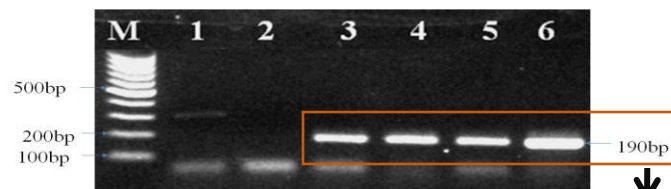
Challenge/Need:

Borneol, a natural medicine coming from essential oils, is a highly soluble bicyclic monoterpene, traditionally used to relieve anxiety, restlessness, and insomnia. It is a novel agent that improves drug delivery by enhancing blood-brain-barrier permeability and is used to improve consciousness in case of coma, heart attack, stroke, traumatic brain injury, and other brain-related emergency conditions.



Cinnamomum cassia

Cinnamomum verum



CVS marker specific to *C. verum*

Technology USPs

- The DNA marker can be employed as an efficient, economical, and reliable molecular marker for the identification of *Cinnamomum verum*
- PCR-based DNA marker which is specifically amplified in *Cinnamomum verum* with amplicon size 190bp, however, no amplification is seen in the *C. cassia*.

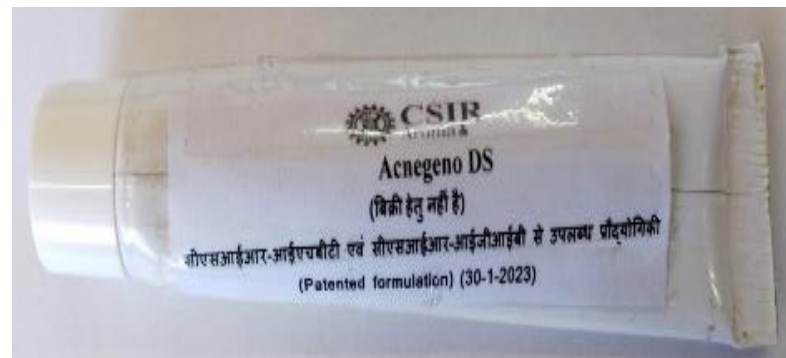
Potential Beneficiaries:

The DNA marker can be applied across diverse sample types, including raw materials, processed foods, herbal supplements, and pharmaceuticals, making them versatile tools for quality control and authentication in various industries.

A synergistic formulation against acne and a process for the preparation thereof

Challenge/ Need:

Acne or *Acne vulgaris* is a common skin disease of the pilosebaceous unit, which afflicts, approximately 90% of the adolescent population in Westernized countries. In India 38.13% of girls and 50.6% of boys in the age group 12-17 years are afflicted with this disease.



Technology USPs:

- Developed base cream having active ingredients (essential oils) mixed in certain proportions to develop the final product
- Effective against antibiotic-resistant acne
- This atypical acne control product is effective in inhibiting the growth of *P. acnes* using western Himalayan essential oils synergistic active formulations.
- Patent: US2022/0184171A1; EP3946397.

Potential Beneficiaries:

Pharmaceutical and Cosmetic Industry

Bioactive leads for therapeutic use

Challenge/ Need:

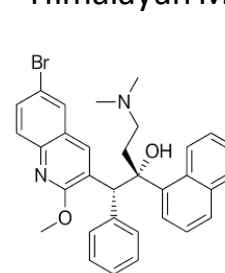
Bioactive compounds in small quantities in foods and plants like fruits, vegetables, nuts, and oils have garnered significant attention for their potential in preventing chronic diseases. These compounds, including polyphenols, carotenoids, vitamins, omega-3 fatty acids, organic acids, nucleosides, nucleotides, and phytosterols, are increasingly recognized for their health promotion. With consumers seeking natural and sustainable solutions to enhance their quality of life through personalized nutrition, bioactive compounds are emerging as promising disease prevention and treatment alternatives.

Technology USPs:

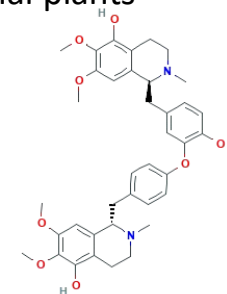
- Bioactive compounds show potential in cancer prevention and treatment of tuberculosis.
- These possess neuroprotective properties that may mitigate neuronal damage and inflammation in various neurological diseases.



Himalayan Medicinal plants



Bedaquiline (FDA approved TB drug)



Thalirugidine (From *Thalictrum foliolosum*)

Thalirugidine Showed efficacy compared to Bedaquiline

Potential Beneficiaries:
Pharmaceutical Industries.

Commercial micropropagation protocol of *Ajuga parviflora* (Neelkanthi)

Ajuga parviflora (Neel Kanthi), a herbaceous plant from the lamiaceae family, known for their medicinal properties due to various phytoconstituents like neoclerodane diterpenoids and volatile oils exhibiting numerous traditional medicinal benefits, including antipyretic, analgesic, antimalarial, and antidiabetic activities. Scientifically, it has been validated for anti-inflammatory, antimicrobial, antiviral, and hepatoprotective effects.



Market Potential

Folk medicine to treat hyperglycemia, asthma, fever, jaundice, HCV, arthritis, cancer, and wounds

Salient features

- Optimization of time effective protocol for rapid multiplication of *Ajuga parviflora*.
- Easily scalable protocol, year round production, uniform quality produce
- Eliminates dependency on natural plant population as raw material
- Tissue culture raised plants can be used by pharmaceutical industry



Micropropagation and in vitro flower induction in *Chlorophytum comosum* (Thunb.) Jacques var. *comosum*

Chlorophytum comosum (Thunb.) Jacques var. *comosum*, a perennial rhizomatous herb, belonging to the family Asparagaceae. It is used in the treatment of respiratory diseases such as bronchitis and asthma. The roots of *C. comosum* could be a good supplement of carbohydrates and calcium. Development of reproductive organs through *in vitro* process are independent of season and can be achieved in lesser time than respective *in vivo* process. The rising demand for this plant in Indian and International drug market can make this species an significant cash crop.

Market Potential

- The global Indoor Plants market size is expected to reach US\$ 13694.78 million with a compounded annual growth rate of 3.91% by 2028.

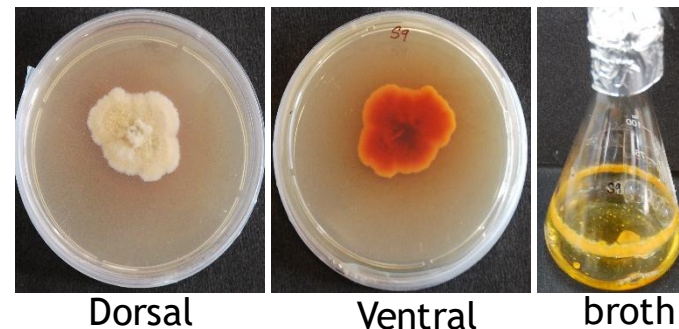
Salient features

- Optimization of time effective protocol for rapid multiplication of *Chlorophytum comosum* (Thunb.) Jacques var. *comosum*.
- Easily scalable protocol, year round production, quality Planting material
- Skill development on micropropagation



Phialophora S9 endophyte for enhanced stigma production in *Crocus sativus*

Crocus sativus, belonging to family Iridaceae is a perennial plant cultivated for its valuable stigma known as Saffron. Saffron produces three major metabolites, crocin, picrocrocin and safranal. Enhancement in stigma yield with intervention of fungal endophytes were carried out. Endophytic fungi *Phialophora* S9 treatment enhanced vegetative and stigma growth along with corm production of saffron. The stigma length and fresh weight increased between 25-30% under endophyte treatment as compare to control.



Market Value

The saffron cost is estimated at US\$ 5000/kg and its market worldwide is growing at CAGR of 5.8% and is estimated to reach USD 1 billion. Current market of saffron is US\$1.5 Billion worldwide. India imported \$18.3 million of saffron.

Salient features

- Organic and eco-friendly
- Increase in Stigma yield with 25-30 % percent improvement
- Improved total corm yield



Mass propagation of *Phyllostachys pubescens* Mazel ex Houzeau de Lehaie: Chinese moso bamboo

Moso bamboo is highly valued for its economic and ecological benefits, with applications ranging from food and construction materials to crafts. Traditional propagation methods are limited by irregular flowering, low seed viability, and unpredictable seed production. Tissue culture techniques, including somatic embryogenesis and organogenesis, provide a viable alternative for rapid and large-scale propagation. This approach ensures a sustainable supply of high-quality plantlets, promoting the widespread cultivation and utilization of moso bamboo in various industries.



Market Value:

Global bamboos market size was estimated at USD 64.45 billion in 2022, expected to rise USD 94.38 billion by 2030.

Salient features:

- Optimization of time effective protocol for rapid multiplication of *Phyllostachys pubescens*.
- Easily scalable protocol, year round production, uniform quality produce
- This will facilitate its genetic improvement and conservation.
- Skill development on micropropagation

