

Regenerative system for production of valerenic acid derivatives using *Valeriana jatamansi* adventitious roots

An *in vitro* process has been developed to produce commercially valuable valerenic acid derivatives from leaf-induced adventitious roots of *V. jatamansi*. In these roots, the overall production of valerenic acid derivatives is around 1500 μ g/g dry weight basis. Besides the presence of key marker compounds i.e. valerenic, acetoxy-valerenic and hydroxyl-valerenic acid, adventitious roots also contained pharmaceutically active compounds like kaempferol and rutin. In addition, these roots yielded over 0.05% essential oil with patchouli alcohol as a key constituent.

Market potential

- Valeriana is the most frequently used herb alone or in combination to treat anxiety and insomnia around the globe
- In India, the estimated annual trade of dried V. *jatamansi* roots is 2000 metric ton (NMPB 2023)

Silent features of the technology

- Shorter *in vitro* cultivation (2 months) cycle compared to field-grown plants (approx. 2 years)
- Batch to batch stable metabolic profile, with no seasonal influence
- Independent of environmental and geographical barriers
- Besides marker bioactive compounds, the adventitious roots are also a good source of essential oil











Mass production of *Siraitia grosvenorii*-a natural sweetener and medicinal plant

Siraitia grosvenorii (Swingle) C. Jeffrey ex A. M. Lu & Zhi Y. Zhang, of family cucurbitaceae is a perennial vine. The fruits of this dioecious plant contain substantial amounts of vitamins, amino acids, proteins, polysaccharides, flavonoids, triterpenoids and essential oils. The effective constituents of fruits are mogrosides; a cucurbitane type triterpenoid glycosides and pulp extracts of mogrosides are estimated to be 250-300 times sweeter than cane sugar and non-caloric, which makes it ideal as a natural sweetener for diabetes and obese patients.



Market Value:

The market size of monk fruit ingredients in 2022 is US\$ 169.1 Million, which reach upto US\$ 267.8 million by 2032.

Salient features:

- Produces large number of disease-free and quality planting material throughout the year.
- The method is a season independent and upscalable.

CSIR-IHBT provides

- Training and skill development programs on tissue culture
- Consultancy to establish tissue culture laboratory





Cinnamon contains metabolite coumarin which is harmful to human health. A high coumarin level increases the risk of liver damage or failure. *Cinnamomum verum* or ceylon cinnamon has a trace amount of coumarin about 0.004% in contrast to the up to 1% found in *Cinnamomum cassia*. Due to the morphologically similarity, *Cinnamomum cassia* is frequently used to adulterate true cinnamon (*C. verum*). CSIR-IHBT has developed PCR-based DNA marker which is specifically amplified in *Cinnamomum verum* with amplicon size 190bp, however, there is no amplification seen in the *C. cassia*. Market potential

Cinnamon market size was estimated at US\$ 916.5 million in 2022. From 2023 to 2029, total revenue is expected to rise at CAGR of 7.83%, reaching US\$ 1553 million.

Silent features of the technology

•The generated CVS DNA marker can be employed as an efficient, economical, and reliable molecular marker for the identification of *Cinnamomum verum*.

•Utilized to spot adulterations with other cinnamon species.



Cinnamomum cassia

Cinnamomum verum



CVS marker specific to C. verum



Process for 2,5-diformylfuran (DFF) synthesis from fructose or low cost carbohydrate feedstock's

2,5-diformylfuran (DFF) is the precursor of polymeric materials, organic conductors, luminophores, fungicides, pharmaceuticals etc. Furthermore, the DFF can be used as a substitute for toxic dialdehydes such as glyoxal or glutardialdehyde, which is used in the leather tanning process to cross-link collagen. Considering the increasing demand for DFF, CSIR-IHBT has developed a low cost, simple, atom economic and scalable process for production of DFF from fructose or other low cost carbohydrates feedstock's.

Salient features of the technology

- One pot, cost effective and atom economical approach
- Scalable process
- Selective synthesis of DFF with high UPLC purity (>95%)





Free flowing decomposer

The Free-flowing decomposer is developed in purview to be used as efficient and hygienic formulation which will complement the automated use of newly developed dry toilets and improve sanitation in the households of cold regions where use of dry toilets is prevalent. It is a dry microbial formulation with appropriate carrier materials which maintains the excellent flow property. It promotes the low-cost conversion of night soil to fertilizer and is highly efficient due to indigenous cold-tolerant hydrolytic bacteria with plant growth-promoting traits to further enrich the final compost.

Market Value:

The global compost market size was valued at \$9.4 billion in 2021 and is expected to reach \$13.6 billion by 2030, growing at a CAGR of 5.1%

Salient features:

- Contains cold- tolerant hydrolytic bacteria
- Enriched with plant growth promoters
- Bacterial immobilization rate is > 80%
- The angle of repose (~30°) represents excellent flow



