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Samabriva's plant based bioproduction of high-value molecules explained...

Plants are an abundant source of valuable natural products. But it’s often challenging to produce those products consistently and cost effectively at commercial scale.

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Samabriva has developed an innovative, scalable and highly stable bioproduction system to produce complex natural active molecules using hairy roots.

This is how our process works...

Firstly, what are hairy roots?

Hairy roots arise at the wound site of plants when they are infected with the soil bacterium *Rhizobium rhizogenes*.

This induces the formation of hairy roots – highly branched, rapidly growing roots.

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Unlike adventitious roots, hairy roots can grow indefinitely and independently of the green parts of the plant.

This unique feature allows them to thrive in bioreactors without any need for light or heat.

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Why are hairy roots important?

They can be manipulated to produce a diverse range of natural compounds* as well as protein-based products like vaccines, monoclonal antibodies, and therapeutic proteins.

This makes them an ideal biotechnology tool for the efficient production of **specialty molecules.**

*compounds include alkaloids, anthocyanins, flavonoids, phenolics, stilbenes, lignans, and terpenoids

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The process explained...

Step 1

Creating the clones

Step 1

Transformation:

Plant tissue is infected with genetically engineered *Rhizobium rhizogenes* bacteria. This stably transfers a segment of its root-inducing (Ri) plasmid into the plant genome.

This transformation induces the formation of hairy roots producing a genetically stable, highly branched, rapidly growing root culture.

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Step 1

Hairy root confirmation:

The bacterial vector is eliminated from the hairy root culture.

PCR tests are typically performed to confirm that the roots are hairy roots and that the bacteria have been eradicated.

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Step 1

Root clone selection:

Among the hundreds of hairy root clones generated, those displaying the best growning capacity and ability to produce the molecule of interest are selected.

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Step 1

Clone amplification:

The selected high-producing hairy root clone(s) are propagated and amplified by repeated subculturing on a suitable growth medium, obtaining sufficient biomass for further scale-up.

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Step 1

Cryopreservation:

Before scale-up, Research, Master, and Working ‘Root’ banks are created using cryopreservation of the clone at -196°C.

Step 1

Establishing the hairy root culture:

The hairy roots are cultured in hormone-free media. These genetically transformed root cultures can produce valuable natural products at levels far higher than the parent plant.

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Step 2

Scale-up and production

Step 2

Scale-up and routine manufacture take place in single-use, large-scale proprietary bioreactors (with volumes of several hundreds of liters).

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Step 2

Elicitation:

Productivity can be further enhanced by treating the hairy root cultures with elicitors that trigger the plant’s defence mechanisms. This leads to increased biosynthesis of natural active molecules (secondary metabolites).

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Step 3

Recovering and purifying the molecule of interest

Step 3

The high value molecules in the hairy root biomass or culture medium are extracted and purified using techniques like filtration or chromatography etc.

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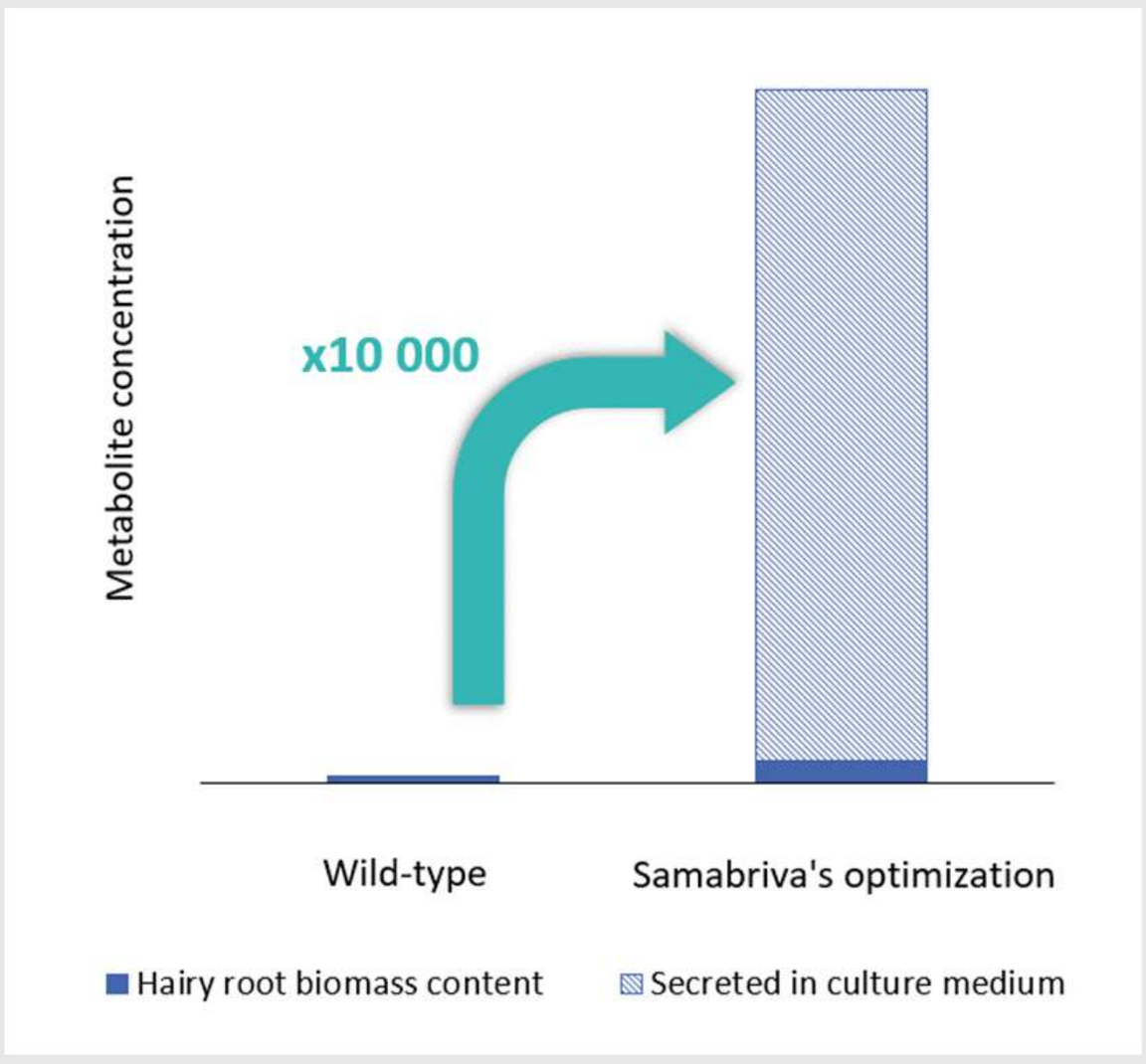
Compared to the wild type, genetic engineering and culture optimization can produce 8,000 to 10,000 times the concentration of the molecule of interest.



Impact of genetic engineering and culture optimization on the production of the molecule of interest.

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Samabriva’s innovative hairy root culture delivers cost-effective, highly productive and consistent manufacturing for the pharmaceutical industry at scale, in any location.

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To find out more,
visit samabriva.com