**Fam. Apiaceae**  
*Daucus carota* L. – Wild carrot

**Origin:** segments of roots, pRi T-DNA *Agrobacterium rhizogenes* ATCC R1601.

**Morphology:** intensively branching thin roots.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Area of application:** cocultivation with arbuscular mycorrhizal (AM) fungi; biotechnology.
Fam. Apiaceae  

*Daucus carota* L. – Wild carrot

**Origin:** segments of roots, pRi T-DNA *Agrobacterium rhizogenes* ATCC R1000.

**Morphology:** intensively branching thin lateral roots structural heterogeneity between different orders of root.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Area of application:** cocultivation with arbuscular mycorrhizal (AM) fungi; biotechnology.
Fam. Apocynaceae  \textit{Apocynum cannabinum} L. –  
Indian Hemp

\textbf{Origin:} segments of seedling’s stem,  
pRi T-DNA \textit{Agrobacterium rhizogenes} ATCC R1601.

\textbf{Morphology:} intensively branching thick roots.

\textbf{Culture conditions:} submerged culture  
the Murashige and Skoog nutrient medium (MS 1/2N)  
at $+25\pm3^\circ\text{C}$, in the dark  
transplantation on the fresh medium after 5 weeks.

\textbf{Stock culture:} solid nutrient medium MS 1/2N  
at $17$-$18^\circ\text{C}$,  
under fluorescent lighting (8h/d).

\textbf{Secondary metabolites:} cardiac glycosides.

\textbf{Area of application:} biotechnology.
Fam. Apocynaceae  
**Rauwolfia serpentina** L. (Benth.) – Snakeroot  

**Origin:** leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture on the Gamborg nutrient medium (B 5) at +25°C±3°C, in the dark. Transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** indole alkaloids (ajmaline, vinorine, vomilenine, perakine).

**Area of application:** enzymology of indole alkaloid biosynthesis; biotechnology.
Fam. Asteraceae  Senecio jacobaea L. – Ragwort

**Origin:** hypocotyl and cotyledons of seedlings, pRi T-DNA Agrobacterium rhizogenes ATCC 15834.

**Morphology:** intensively branching roots with deep downiness.

**Culture conditions:** submerged culture
the Gamborg nutrient medium (B 5)
at +25°C±3°C, in the dark
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5
at 17-18°C,
under fluorescent lighting (8h/d).

**Secondary metabolites:**
supposedly - pyrrolizidine alkaloids.

**Area of application:** biotechnology.
Origin: hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC R 1601.

**Morphology:** intensively branching roots with nigrescent basal parts.

**Culture conditions:** submerged culture on the Murashige and Skoog nutrient medium (MS 1/2N) at +25°C±3°C, in the dark. Transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium MS 1/2N at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** essential oil and thiophenes.

**Area of application:** cocultivation with arbuscular mycorrhizal (AM) fungi; biotechnology.

Fam. Asteraceae  
*Tagetes patula* L. – French marigold  
Tag. pat.
**Fam. Caryophyllaceae**  
**Silene vulgaris** L. – Bladder Campion

**Origin:** hypocotyl of seedlings,  
pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** thin intensively branching roots.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at +25°C±3°C, in the dark  
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5  
at 17-18°C,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology;  
accumulation of high-density metals.
Fam. Convolvulaceae  **Convolvulus krauseanus**
Regel et Schmalh. –
Bindweed

**Origin:** hypocotyl of seedlings,
pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** too law rhizogenesis, with capacity to intensive calligenesis.

**Culture conditions:** submerged culture
the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark
transplantation on the fresh medium after 5 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C,
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology.
Fam. Crassulaceae  

**Rhodiola rosea** L. –  
Golden Root  

**Origin:** hypocotyl and leaves of seedlings,  
pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching thin roots.

**Culture conditions:** submerged culture  
the Street nutrient medium (S)  
at +25°C±3°C, in the dark  
transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium at 17-18°C,  
under fluorescent lighting (8h/d);  
artificial seeds - preservation under +4°C during  
6 weeks.

**Secondary metabolites:**  
phenylpropane glycosides.

**Area of application:** biotechnology.
Fam. Cruciferae

**Armoracia lapathifolia Gilib.** – Horseradish

**Origin:** leaves of plant, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching thin roots; spontaneous consequence of stem organogenesis.

**Culture conditions:** submerged culture the Murashige and Skoog nutrient medium (MS 1/2N) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium MS 1/2N at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** mustard oils.

**Area of application:** biotechnology.
Fam. Fabaceae  *Hedysarum theinum Krasnob.* – *Hedysarum*

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching short-cut and thick roots.

**Culture conditions:** submerged culture
the Street nutrient medium (S)
at +25±3°C, in the dark
transplantation on the fresh medium after 5 weeks.

**Stock culture:** solid nutrient medium S
at 17-18°C,
under fluorescent lighting (8h/d);
artificial seeds - preservation under +4°C during 6 weeks.

**Secondary metabolites:** isoflavones (ononin, malonyl ononin, formononetin).

**Area of application:** biotechnology.
Fam. Fabaceae  

**Hedysarum ehaffae** B.Sultaniva – Hedysarum

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching roots with friable periderm.

**Culture conditions:** submerged culture

the Street nutrient medium (S)
at +25°±3°C, in the dark
transplantation on the fresh medium after 6 weeks.

**Stock culture:** solid nutrient medium S

at 17-18°C,
under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavones (ononin, malonyl ononin, formononetin).

**Area of application:** biotechnology.
Fam. Fabaceae  

*Hedysarum daraut-kurganicum*

B. Sultanova –
Hedysarum

Origin: hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching short-cut roots.

**Culture conditions:** submerged culture
the Street nutrient medium (S) at +25°±3°C, in the dark
transplantation on the fresh medium after 6 weeks.

**Stock culture:** solid nutrient medium S at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.
**Fam. Fabaceae**  
*Hedysarum parvum* B. Sultanova – Hedysarum

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching short-cut roots.

**Culture conditions:** submerged culture the Street nutrient medium (S) at +25±3°C, in the dark transplantation on the fresh medium after 6 weeks.

**Stock culture:** solid nutrient medium S at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.
**Fam. Fabaceae**  
*Hedysarum santalaschi* B. Fedsch. – *Hedysarum*

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching roots, which secrete some yellow secondary metabolites into the medium.

**Culture conditions:** submerged culture the Street nutrient medium (S) at +25±3°C, in the dark transplantation on the fresh medium after 6 weeks.

**Stock culture:** solid nutrient medium S at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.
**Fam. Fabaceae**  
**Glycyrrhiza uralensis** L. – *Licorice*  
[![Image of Licorice](image.png)](image.png)

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching short-cut roots with elements of callus in the apical part of roots.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°C±3°C, in the dark transplantation on the fresh medium after 5 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds (absence of glycyrrhizin acid).

**Area of application:** biotechnology.
Fam. Fabaceae  

*Lupinus polyphyllus* L. – Lupine

**Origin:** leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching long and thick roots.

**Culture conditions:** submerged culture

the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark

transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.
Fam. Fabaceae

*Ononis arvensis* L. – Restharrow

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC R 1601.

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.
Fam. Fabaceae  

*Ononis arvensis* L. – Restharrow

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching roots, which secrete some yellow secondary metabolites into the medium.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°C±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.
Ononis spinosa L –
Restharrow

**Origin:** hypocotyl of seedlings,
pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching roots, with nigrescent basal parts.

**Culture conditions:** submerged culture
the Gamborg nutrient medium (B 5)
at +25°±3°C, in the dark
transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5
at 17-18°C,
under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.
Fam. Fabaceae  Sophora korolkovii Koehne – Sophora

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching and rapidly nigrescent roots.

**Culture conditions:** submerged culture
the Gamborg nutrient medium (B 5) at +25°C±3°C, in the dark transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.
Fam. Fabaceae  

*Thermopsis turkestanica* Gand. –  
Thermopsis

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching short-cut roots.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at +25°±3°C, in the dark  
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5  
at 17-18°C,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology.
Fam. Fabaceae  

*Trifolium repens* L. –  
White Clover

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture the Murashige and Skoog nutrient medium (MS 1/2N) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium MS 1/2N at 17-18°C, under fluorescent lighting (8h/d).

**Area of application:** cocultivation with arbuscular mycorrhizal (AM) fungi; biotechnology.
**Fam. Lamiaceae**  

**Salvia officinalis L.** – Sage  

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC R 1000.

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at +25°C±3°C, in the dark  
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5  
at 17-18°C,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.
**Fam. Lamiaceae**  
*Scutellaria baicalensis* Georgi. – **Skullcap**  

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching roots with rapid growth.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at +25±3°C, in the dark  
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium S  
at 17-18°C, under fluorescent lighting (8h/d);  
artificial seeds, preservation under +4 °C during 6 weeks.

**Secondary metabolites:** phenolic compounds – flavones (baicalein, baicalin, wogonin, wogonoside, chrisin)

**Area of application:** medicinal and food industry, cosmetology
**Fam. Lamiaceae**  
*Scutellaria andrachnoides* Vved. – **Skullcap**

**Origin**: hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology**: thin roots with poor growth, which have quickly changed into the undifferentiated intensively growing callus culture with capacity for becoming green under lighting.

**Culture conditions**: submerged culture the Gamborg nutrient medium (B 5) at +25±3°C, in the dark transplantation on the fresh medium after 4 weeks.

**Stock culture**: solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites**: phenolic compounds (acteoside).

**Area of application**: biotechnology.
**Fam. Linaceae**  
*Linum usitatissimum* L.  
var. Atalante –  
Flax  

**Origin:** cotyledons of seedlings,  
pRi T-DNA *Agrobacterium rhizogenes* ATCC LBA 9402.

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at +25°±3°C, in the dark  
transplantation on the fresh medium after 4 weeks;  
has a poor growth on the solid nutrient medium.

**Secondary metabolites:**  
cianogenic glycosides, lignanes.

**Area of application:** biotechnology;  
biochemistry of cianogenic glycoside synthesis and transport.
**Fam. Rubiaceae**  
*Rubia tinctorum* L. – Madder

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching coloured roots.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** anthraquinones (alizarin, purpurin and their derivatives).

**Area of application:** enzymology of anthraquinone biosynthesis; biotechnology.
Fam. Rutaceae  

*Ruta graveolens* L. – Garden Rue

**Origin:** hypocotyl and leaves of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC 15834.

**Morphology:** intensively branching roots with rapid growth.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 4 weeks, has a poor growth on the solid nutrient medium.

**Stock culture:** artificial seeds, preservation under +4 °C during 12 weeks.

**Secondary metabolites:** flavonoids; furanocoumarines; furoquinoline, quinoline, and acridone alkaloids; essential oil.

**Area of application:** enzymology of coumarine and acridone alkaloid biosynthesis; distribution of secondary metabolites in the root tissues; viability and cytochemistry of border cells.
Fam. Zygophyllaceae  

*Peganum harmala L.* – Syrian Rue

**Origin:** hypocotyl of seedlings, pRi T-DNA *Agrobacterium rhizogenes* ATCC A 4.

**Morphology:** intensively branching short-cut roots.

**Culture conditions:** submerged culture the Gamborg nutrient medium (B 5) at +25°±3°C, in the dark transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium B 5 at 17-18°C, under fluorescent lighting (8h/d).

**Secondary metabolites:** ß-carboline alkaloids (harmine, harmaline, harmol, harmalol) and 5-hydroxytryptamine (serotonin).

**Area of application:** biogenesis of serotonin and ß-carboline alkaloids.