

Fam. Apiaceae

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

D. c. 1601

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.

**Stock culture:** solid nutrient medium B 5  
at  $17\text{-}18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

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



Fam. Apiaceae

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

**D. c. 1000**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

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

Fam. Apocynaceae

***Apocynum cannabinum* L. –  
Indian Hemp**

Ap. can.

**Origin:** segments of seedling's stem,  
pRi T-DNA *Agrobacterium rhizogenes* ATCC R1601.

**Morphology:** intensively branching thick roots.

**Culture conditions:** submerged culture  
the Murashige and Skoog nutrient medium (MS 1/2N)  
at  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 5 weeks.



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

**Secondary metabolites:** cardiac glycosides.

**Area of application:** biotechnology.

Fam. Apocynaceae

***Rauwolfia serpentina* L. (Benth.) –  
Snakeroot**

R. s.

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

**Morphology:** intensively branching roots.

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
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**

**Sen. jac.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

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

**Area of application:** biotechnology.

Fam. Asteraceae

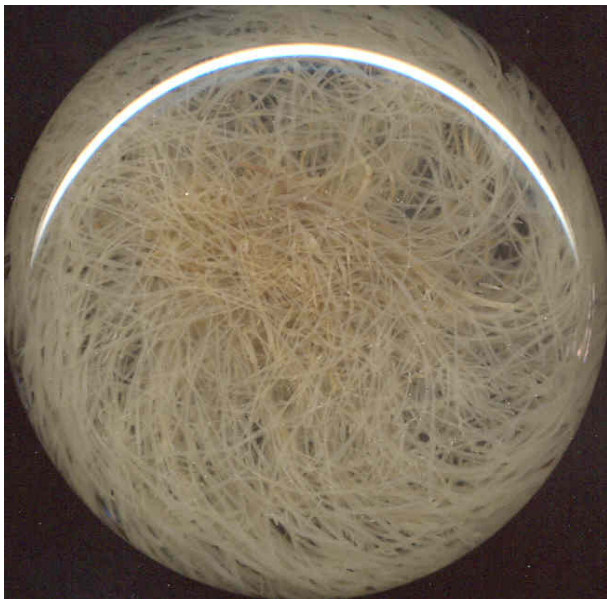
***Tagetes patula* L. –  
French marigold**

Tag. pat.

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

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

**Culture conditions:** submerged culture  
the Murashige and Skoog nutrient medium (MS 1/2N)  
at  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



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

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

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

Fam. Caryophyllaceae

***Silene vulgaris* L. –  
Bladder Campion**

**Sil. vul.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology;  
accumulation of high-density metals.

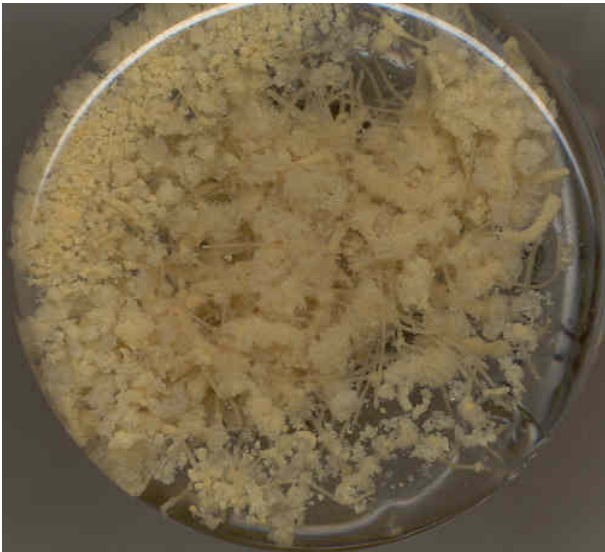
Fam. Convolvulaceae *Convolvulus krauseanus*  
Regel et Schmalh. –  
Bindweed

Conv. kr.

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

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

**Culture conditions:** submerged culture  
the Gamborg nutrient medium (B 5)  
at  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 5 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology.



Fam. Crassulaceae

***Rhodiola rosea* L. –  
Golden Root**

Rh. r.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



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

**Secondary metabolites:**  
phenylpropane glycosides.

**Area of application:** biotechnology.

Fam. Cruciferae

***Armoracia lapathifolia* Gilib. –  
Horseradish**

**Arm. lap.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



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

**Secondary metabolites:** mustard oils.

**Area of application:** biotechnology.

Fam. Fabaceae

***Hedysarum theinum* Krasnob. –  
Hedysarum**

Hed. th.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 5 weeks.



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

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

**Area of application:** biotechnology.

Fam. Fabaceae

***Hedysarum ehaffae* B.Sultaniva –  
Hedysarum**

Hed. en.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 6 weeks.



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

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

**Area of application:** biotechnology.

Fam. Fabaceae

*Hedysarum daraut-kurganicum*

B.Sultanova –  
Hedysarum

Hed. dar.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 6 weeks.



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

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.

Fam. Fabaceae

***Hedysarum parvum* B. Sultanova –  
Hedysarum**

**Hed. parv.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 6 weeks.



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

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.

Fam. Fabaceae

***Hedysarum santalasi* B. Fedtsch. –  
Hedysarum**

**Hed. sant.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 6 weeks.



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

**Secondary metabolites:** isoflavones.

**Area of application:** biotechnology.

Fam. Fabaceae

***Glycyrrhiza uralensis* L. –  
Licorice**

**Gl. ur.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 5 weeks.



**Stock culture:** solid nutrient medium B 5 at  
 $17-18^{\circ}\text{C}$ , under fluorescent lighting  
(8h/d).

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

**Area of application:** biotechnology.



Fam. Fabaceae

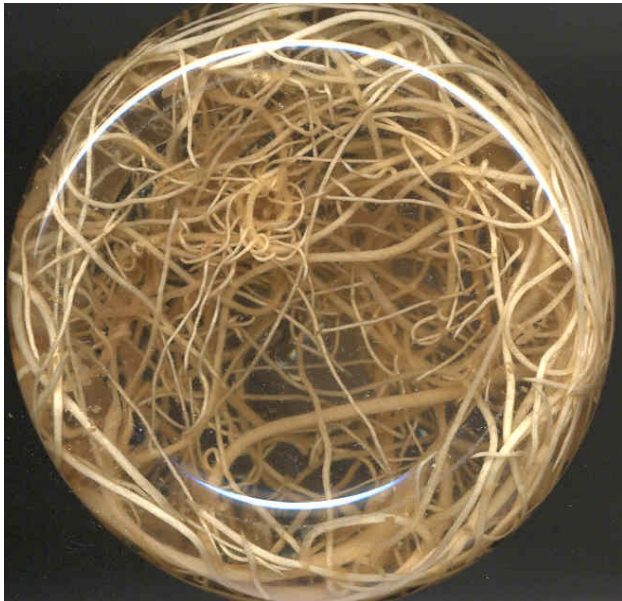
*Lupinus polyphyllus* L. –  
Lupine

Lup. pol.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.

Fam. Fabaceae

***Ononis arvensis* L. –  
Restharrow**

**On. ar. 1601**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.

Fam. Fabaceae

***Ononis arvensis* L. –  
Restharrow**

**On. ar. A 4**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium  
after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.

Fam. Fabaceae

***Ononis spinosa* L –  
Restharrow**

On. sp.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** isoflavonoids.

**Area of application:** biotechnology.

Fam. Fabaceae

***Sophora korolkovii* Koehne –  
Sophora**

S. kor.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.

Fam. Fabaceae

***Thermopsis turkestanica* Gand. –  
Thermopsis**

Th. turk.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** unknown.

**Area of application:** biotechnology.

**Fam. Fabaceae**

***Trifolium repens* L. –  
White Clover**

**Trif. rep.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



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

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

Fam. Lamiaceae

***Salvia officinalis* L. –  
Sage**

Sal. of.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

**Secondary metabolites:** phenolic compounds.

**Area of application:** biotechnology.



Fam. Lamiaceae

***Scutellaria baicalensis* Georgi. –  
Skullcap**

**Scut. baic.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.

**Stock culture:** solid nutrient medium S  
at  $17\text{-}18^{\circ}\text{C}$ , under fluorescent  
lighting (8h/d);  
artificial seeds, preservation  
under  $+4^{\circ}\text{C}$  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**

**Scut. andr.**

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5  
at  $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

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

**Area of application:** biotechnology.

Fam. Linaceae

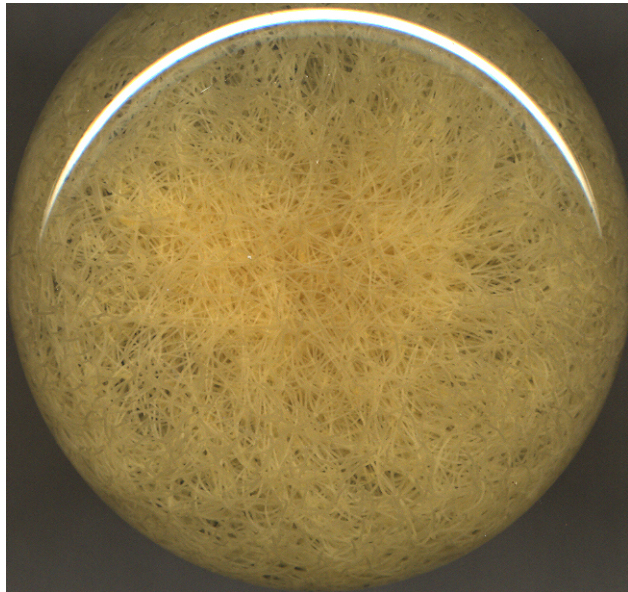
*Linum usitatissimum* L.  
var. **Atalante** –  
Flax

L.usit. atalante

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , 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

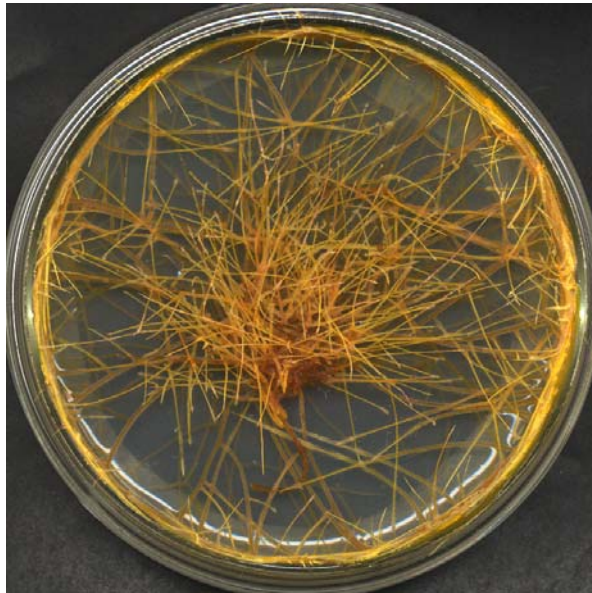
***Rubia tinctorum* L. –  
Madder**

R. t.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 3 weeks.



**Stock culture:** solid nutrient medium B 5 at  
 $17-18^{\circ}\text{C}$ ,  
under fluorescent lighting (8h/d).

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

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

Fam. Rutaceae

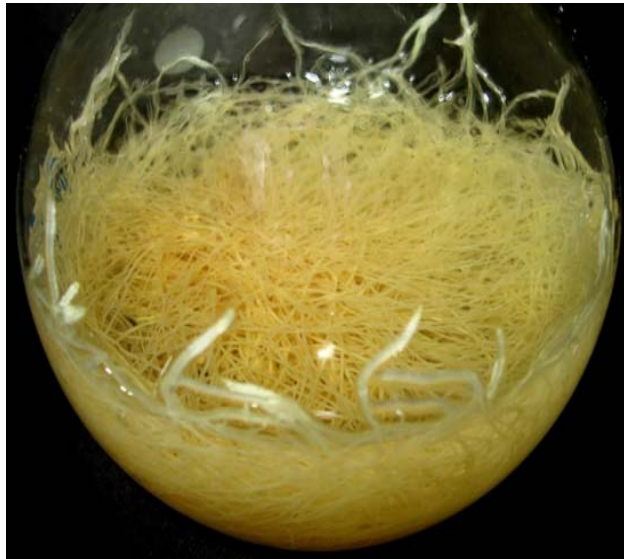
***Ruta graveolens* L. –  
Garden Rue**

R. gr.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , 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  $+4^{\circ}\text{C}$  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**

P. h.

**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  $+25^{\circ}\pm 3^{\circ}\text{C}$ , in the dark  
transplantation on the fresh medium after 4 weeks.



**Stock culture:** solid nutrient medium B 5 at  
 $17-18^{\circ}\text{C}$ , under fluorescent lighting  
(8h/d).

**Secondary metabolites:**

$\beta$ -carboline alkaloids (harmine, harmaline,  
harmol, harmalol) and 5-hydroxytryptamine  
(serotonin).

**Area of application:** biogenesis of serotonin and  
 $\beta$ -carboline alkaloids.