## ISOQUINOLINE ALKALOID BIOSYNTHESIS Phenylalanine, tyrosine and tryptophan biosynthesis L-Tyrosine **▶**©°Lycorine 3.4-Dihydroxybenzaldehyde K14455... K01592 K03334 K01593 K00815. K00832. 🖜 Crinine Tyramine - | 2.1.1.- | **- ▶ ⊙** Galanthamine ┨ 1.1.1.- ┠ **P**O73 4-Hydroxyphenylpyruvate 4'-Methylnorbelladine N-Demethylnarwedine N-Demethylgalanthamine Norbelladine L-Dopa 🍑 K00505 4.1.1.80 1.14.13.-4 Hydroxydihydrocinnamaldehyde K01592 K01593 4-Hydroxyphenylacetadehyde箪 Dopamine ↓ Autumnaline Isoandrocymbine O-Methylandrocymbine N-Formyldemecolcine Demecolcine Deacetylcolchicine Colchicine **▶**©° 2.1.1.-Floramultine Tyrosine metabolism 2.1.1.-🕶 Kreysigine K00274 K00276 φSecologanin Ankorine (S)-Norcoclaurine © 3,4DHPAA 4.3.3.4 4.3.3.3 (S)-Norlaudanosoline (S)-Coclaurine, Protoemetine Deacetylipecoside 🔷 2'-Norberbamunine \*\* Deacety- Glisoipecoside Emetine 🗨 (R)-N-Methylcoclaurine spontaneous spontaneous Guattegaumerine 🍽 🛎 🔊 Cephaeline ♥ (R)-Norre-°♥°ticuline Berbamunine \*\* Demethyl- o Deoxy-tubulosine Demethyl-**™**Tubulosine alangiside (S)-N-Methylcolaurine o Papaverine (S)-6-O-Methyl-norlaudanosoline (S)-3'-Hydroxy- °• N-methylcoclaurine | 2.1.1.121 (S)-Nororientaline Alangiside Alangimarckine Isoalangiside °♥(S)-Norreticuline (S)-Reticuline, Tetrahydropalmatine 1.3.3.8 2.1.1.89 1.5.-.-(S)-Tetrahydrocolumbamine Columbamine Palmatine 2.1.1.147 **►●** Corydaline ° (S)-Cory-tuberine 1.3.3.8 • 1,2-Dehydro-reticulinium ° 👺 Laudanine (S)-Scoulerine 1.21.3.2 1.5.1.27 1.1421.2 2.1.1.-Berberine (S)-Canadine 1.5.1.31 ► • (R)-Canadine °♥⁴(S)-Cheilan-thifoline 1.3.3.8 🚅 🍑 \*(R)-Reticuline Magnoflorine °**∳**°Salutaridine °**ं**(S)-Stylopine (R)-Norreticuline ≈(S)-cis-N- ~ od (S)-cis-N-Methylstylopine Methylcanadine °**♥**Salutaridinol 1.14.13.37 1.14.13.37 ေနည်း Salutaridinol ံ**ငှံ**းProtopine 🍑 Allocryptopine acetate spontaneous 1.14.13.55 🍑 6-Hydroxyprotopine Neopinone 🕶 🖛 Thebaine spontaneous spontaneous 12-Hydroxy-dihydrochelirubine Dihydromacarpine Dihydro-sanfuinarine dihydrosanguinarine Chelirubine **▶○** 1.14.13*5*7 °**ф**'Oripavine ┥21.1.119ト Codeinone<sup>c</sup> 💜 1.5.3.12 1.5.3.12 1.5.3.12 ° ✓ Morphinone Sanguinarine Codeine 💇 Chelirubine Macarpine **►**™ Morphine 00950 3/14/14 (c) Kanehisa Laboratories