Carotenoid Metabolism & Mycorrhiza

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- Biosynthetic pathways of SL and CH/MR-type apocarotenoids
- Dynamics of arbuscule development and degeneration linked to CH/MR accumulation
- Role of SL and CH/MR-type apocarotenoids in the AM symbiosis
- Phosphate starvation-mediated regulation of carotenoid biosynthesis and cleavage

Biosynthetic pathways of SL and CH/MR-type apocarotenoids

Plants have evolved isogenes for specific key steps of carotenoid biosynthesis with differential expression. Early work of the group involved the discovery of an AM-regulated isogene for 1-deoxy-d-xylulose 5-phosphate synthase (DXS2) of the MEP pathway and its involvement in CH/MR biosynthesis, which was later shown to be also important for trichome isoprenoids.
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Role of SL and CH/MR-type apocarotenoids in the AM symbiosis

Known initially only as a germination-inducing agent for seeds of parasitic weeds, in 2005 SLs have been described as AM-relevant compounds, which promote hyphal branching. Only recently their general role as phytohormones regulating shoot branching in response to nutrient stress is beginning to be elucidated.
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Dynamics of arbuscule development and degeneration linked to CH/MR accumulation

Based on a number of experimental results, a model has been presented, which predicts a role for CH apocarotenoids in arbuscule turnover by acting as a cell-specifically produced plant allelochemical on the fungus. This may promote or accelerate the degeneration of fungal arbuscules poorly delivering mineral nutrients without harming the plant cell.
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Phosphate starvation-mediated regulation of carotenoid biosynthesis and cleavage

The massive local accumulation of CH/MR apocarotenoids in arbusculated cells of mycorrhizal roots clearly involves activation of both carotenoid-producing and carotenoid cleaving steps indicating that these compounds are not produced from existing root carotenoids.
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