**Tricin, a flavonoid monomer in monocot lignification**

A valuable ‘new’ compound is available from lignin ‘waste’ streams. Lignin, a complex phenylpropanoid polymer in the plant cell wall, is synthesized via oxidative radical coupling reactions from three prototypical monolignols. Several novel monomers, all deriving from the monolignol biosynthetic pathway, have been found to incorporate into lignin in wild-type and transgenic plants; these findings imply that plants are quite flexible in being able to use a variety of monomers during lignification to form the heterologous lignin polymer. Most recently, and as addressed more fully here, the flavonoid tricin has been found as a monomer in monocot lignins, providing the first example of a monomer from outside the monolignol biosynthetic pathway to be implicated in lignification. Tricin was recently discovered in lignin preparations from wheat (*Triticum aestivum*) straw and subsequently in all monocot samples examined. To provide proof that tricin is involved in lignification and establish the mechanism by which it incorporates into the lignin polymer, the 4'-*O*-**-coupling products of tricin with the monolignols (*p*-coumaryl, coniferyl, and sinapyl alcohols) were synthesized along with the trimer that would result from its 4'-*O*-**-coupling with sinapyl alcohol and then coniferyl alcohol. Tricin was also found to cross couple with monolignols to form tricin-(4'-*O*-**)-linked dimers in biomimetic oxidations using peroxidase/hydrogen peroxide or silver (I) oxide. Nuclear magnetic resonance characterization of gel-permeation-chromatography-fractionated acetylated maize (*Zea mays*) lignin revealed that the tricin moieties are found in even the highest molecular weight fractions, ether-linked to lignin units, demonstrating that tricin is indeed incorporated into the lignin polymer. These findings suggest that tricin is fully compatible with lignification reactions, is an authentic lignin monomer and, because it can only start a lignin chain, functions as a nucleation site for lignification in monocots. This initiation role helps resolve a long-standing dilemma that monocot lignin chains do not appear to be initiated by monolignol homodimerization as they are in dicots that have similar syringyl-guaiacyl compositions. The term flavonolignin is recommended for the racemic oligomers and polymers of monolignols that start from tricin (or incorporate other flavonoids) in the cell wall, in analogy with the existing term flavonolignan that is used for the low-molecular mass compounds composed of flavonoid and lignan moieties. Importantly, tricin, as a member of the flavonoid family, is recognized as a valuable human health compound due to its antioxidant, anti-aging, anticancer, and cardioprotective properties. Tricin should be moderately readily releasable from monocot lignin waste streams; therefore, its incorporation into the lignin of bioenergy crops provides a new source of this valuable product.

**References:** Lan, W., Lu, F., Regner, M., Zhu, Y, Rencoret, J., Ralph, S. A., Zakai, U. I., Morreel, K., Boerjan, W., Ralph, J. (2015) Tricin, a flavonoid monomer in monocot lignification. Plant Physiology **167**, 1284-1295.

**Contact**: Dr. N. Kent Peters, SC-23.2, (301) 903-5549