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**A new class of lignin monomers**

Lignin polymers derived in part from a previously unconsidered class of lignin monomers, the hydroxystilbenes.

**The Science**

Recent discoveries indicate that lignification is a flexible mechanism and that plants are capable of using a variety of phenolic compounds for the formation of lignin polymers. In this study, we report the occurrence of a new class of polyphenolic compounds – hydroxystilbenes – the second such class arising from outside the monolignol biosynthetic pathway, in the lignins of palm fruit endocarps.

**The Impact**

Lignin is a plant cell polymer that binds fibers together but makes processing difficult. Incorporating nonconventional monomers, or monomers not usually present in the lignin of other plants, has the potential to produce an entirely new generation of modified lignin polymers, opening up new ways to engineer the lignin structure to produce polymers and plant-based biomaterials with properties that enable processing and/or valorization.

**Summary**

Lignin is traditionally formed from three monomers, the so-called monolignols (*p*-coumaryl, coniferyl, and sinapyl alcohols). Recently, we discovered in grass lignins a phenolic monomer that falls outside the canonical lignin biosynthetic pathway, the flavone tricin. As we show here, palm fruit (macaúba [*Acrocomia aculeata*], carnauba [*Copernicia prunifera*], and coconut [*Cocos nucifera*]) endocarps contain lignin polymers derived in part from a previously unconsidered class of lignin monomers, the hydroxystilbenes, including the valuable compounds piceatannol and resveratrol. Piceatannol could be released from these lignins upon derivatization followed by reductive cleavage, a degradative method that cleaves β-ether bonds, indicating that at least a fraction is incorporated through labile ether bonds. Nuclear magnetic resonance spectroscopy of products from the copolymerization of piceatannol and monolignols confirms the structures in the natural polymer and demonstrates that piceatannol acts as an authentic monomer participating in coupling and cross-coupling reactions during lignification. Therefore, palm fruit endocarps contain a new class of stilbenolignin polymers, further expanding the definition of lignin and implying that valuable compounds such as piceatannol and resveratrol are potentially available in what is now essentially a waste product.

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**Publications**

del Rio, J. C. *et al.* “Hydroxystilbenes are monomers in palm fruit endocarp lignins**.”** *Plant Physiology* **174**, 2072-2082 (2017) [DOI: 10.1104/pp.17.00362].

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