Flavonoid biosynthesis in the tea plant Camellia sinensis: properties of enzymes of the prominent epicatechin and catechin pathways.

Punyasiri PA, Abeysinghe IS, Kumar V, Treutter D, Duy D, Gosch C, Martens S, Forkmann G, Fischer TC.

Abstract

Leaves of tea (Camellia sinensis L.) contain extraordinary large amounts of (-)-epigallocatechin, (-)-epicatechin, (+)-gallocatechin, and (+)-catechin and derivatives of these compounds that show positive effects on human health. The health-promoting effects of flavan 3-ols, especially those of green tea, are of scientific and public interest. Furthermore, they play a crucial role in defense against pathogens of tea. Therefore, biosynthesis of these flavonoid compounds was investigated. The anthocyanidin reductase enzyme recently described from Arabidopsis and Medicago was shown to be present in tea with very high activity and produces epicatechin as well as epigallocatechin from the respective anthocyanidins, thus explaining the very high contents of these compounds. A strong combined dihydroflavonol 4-reductase/leucoanthocyanidin 4-reductase activity was demonstrated and catalyzes the key steps in catechin and gallocatechin formation. Together with the enzyme activities and substrate specificities of the preceding enzymatic reactions, the biosynthesis of the most prominent flavonoids of tea is elucidated.

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