

Enzymatic polymerization of phenolic compounds.

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Abstract

Phenolics are natural compounds which contains hydroxyl group bonded to aromatic hydrocarbon ring. These compounds can be divided into two categories depending on the oxidation state of the central pyran ring: flavonoids and non-flavonoids. It is important to highlight the excellent properties of the phenolic compounds, such as anti-inflammatory, antimicrobial, and antioxidant activity. It has been described that the oxidation of phenolic compounds enhances its antimicrobial properties since the resulting polymers can contribute to the microorganism's toxification. The polymerization reaction can be achieved by different biocatalysts such as oxidoreductases, namely laccases and peroxidases. Laccases use molecular oxygen as a co-substrate, being therefore the perfect co-substrate. Depending on the structure of the phenolic compound, namely the number of hydroxyl groups, the enzymatic polymerization can be performed via laccase or using laccase-mediator systems (LMSs). On the first reaction, the phenolic compound is oxidized and the resulting phenoxy radicals conduct to polymers formation through recombination processes. On the second method, the phenolic compound oxidation is mediated by redox species yielding the polyphenols formation. Any of these two routes allows the polymerization of phenolic products with enhanced properties.