Rhodotorula toruloides for carotenoid production using waste hardwood biomass

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This work explores the potential of underutilized urban pruning residues from hardwood as feedstocks for bioprocesses based on the carotenogenic yeast Rhodotorula toruloides, investigating the correlation between biomass composition and carotenoids production. Enzymatic hydrolysates from woods and barks of sessile oak and mulberry tree were used as substrates for microbial fermentation, obtaining superior titers and productivity of β-carotene and torulene when compared to previous published processes. Mulberry tree bark hydrolysate yielded the highest total sugars (16.4 g/L), but sessile oak bark hydrolysate showed the highest β-carotene production (362.7 mg/L) after 30 hours of fermentation. Woody biomasses are known to contain significant amounts of extractive inhibitory compounds. Surprisingly, when we removed them in order to promote growth and production, we observed a significant drop in carotenoids titers, which resulted in line with published productions from biomasses lacking extractive components. These data suggest that stressful compounds present in the extractive fractions are crucial for promoting high production and productivity, when compared with the use of biomasses lacking such components. This research therefore highlights the potential of underexplored urban woody residues , thanks to the presence of triggering components, as an advantageous feedstock for microbial carotenoids production.