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New biopolymer from Comfrey: Chemistry and biological activity

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Comfrey root has been used as a traditional medicinal plant for the treatment of painful muscle and joint complaints for centuries. Recently, biologically active polymer has been isolated from Caucasian species of comfrey *Symphytum asperum* Lepech. and *S. caucasicum* Bieb. This polymer - poly[3-(3,4-dihydroxyphenyl)glyceric acid] (p-DGA) is a representative of a new class of natural polyethers with a residue of 3-(3,4-dihydroxyphenyl)-glyceric acid (DGA) as the repeating unit. P-DGA exhibits high antioxidant, anti-inflammatory, wound healing and anticancer activities. In order to compare biological properties of natural polymer with its synthetic analogues, racemic and pure enantiomeric forms of DGA as well as a methylated analogue of p-DGA - poly(MCDMPO) as a precursor of p-DGA were synthesized. The racemic monomer and its virtually pure enantiomers were synthesized via Sharpless asymmetric dihydroxylation of trans-caffeic acid derivatives using an potassium osmate catalyst, a stoichiometric oxidant N-methylmorpholine-N-oxide and enantio-complementary catalysts cinchona alkaloid derivatives (DHQ)2-PHAL and (DHQD)2-PHA as chiral auxiliaries. Poly(MCDMPO) was obtained via ring opening polymerization of 2-methoxycarbonyl-3-(3,4-dimethoxyphenyl)-oxirane (MCDMPO) using a cationic initiator. Comparative investigation of antioxidant properties of natural polymer and its monomer revealed that the latter appeared 40 fold active than polymer, however anticancer efficacy of p-DGA against human prostate cancer (PCA) cells is more compared to its synthetic monomer. Poly(MCDMPO) did not show any activity against PCA.

Biography

Maia Merlani has completed her PhD from Tbilisi State University. She is a Senior Research Scientist at Tbilisi State Medical University, Department of Plant Biopolymers. Her field of interest is a Chemistry and synthesis of Natural Compounds. She is the author of more than 55 papers in reputed journals and presentations at 60 international scientific conferences. She was granted Georgian Presidential Scholarship for Young Scientists (1997), NATO Scholarship (2002, 2003-2006) and Matsumae International Foundation Scholarship (2013). She is a member of organizing committee of several international conferences in the field of Organic and Pharmaceutical Chemistry.

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