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Plant polyether with potential therapeutic effect

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Within the field of pharmacologically active biopolymers, the area of stable polyethers seems rather new and attractive. The high-molecular water-soluble fractions from different species (*Symphytum asperum, S. caucasicum, S. officinale, S. grandiflorum and Anchusa italica*) of *Boraginaceae* family were isolated. According to IR, ^{13}C and ^{1}H NMR, 2D heteronuclear $^{1}H/^{13}C$ HSQC spectral data, and 1D NOE and 2D DOSY experiments the main structural element of these preparations was found to be a regularly substituted by 3,4-dihydroxyphenyl and carboxyl groups polyoxyethylene backbone, namely poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA) or poly[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)ethylene]. The racemic monomer 2,3-dihydroxy-3-(3,4-dihydroxyphenyl)propionic acid (DDPPA) and its enantioselective synthesis of virtually pure enantiomers, (+)-(2R,3S)-DDPPA and (–)-(2S,3R)-DDPPA were carried out via sharpless asymmetric dihydroxylation of trans-caffeic acid derivatives using an osmium catalyst, a stoichiometric oxidant N-methylmorpholine-N-oxide and (DHQ)2-PHAL and (DHQD)2-PHAL as chiral auxiliaries. The determination of enantiomeric purity of the novel chiral glyceric acid derivatives was performed by high-performance liquid chromatographic techniques on the stage of their alkylated precursors. PDPGA has wide spectrum of biological activity: anticomplementary, antioxidant, antiinflammatory properties, burn and wound healing effect. PDPGA and DDPPA exerted anti-cancer efficacy *in vitro* and *in vivo* against androgen-dependent and independent human prostate cancer (PCA) cells via targeting androgen receptor, cell cycle arrest and apoptosis without any toxicity, together with a strong decrease in prostate specific antigen level in plasma. However, our results showed that anticancer efficacy of PDPGA is more effective compared to its synthetic monomer. Overall, this study identifies PDPGA as a potent agent against PCA without any toxicity and supports its clinical application.

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Drought stress-induced physiological and biochemical changes in opium poppy (*Papaver somniferum* L.) cultivars under *in vitro* conditions

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Opium poppy (*Papaver somniferum* L.) is a very important medicinal plant cultivated for seed, oil and opium for food, perfume, cosmetic and medicinal industries. Unsuitable climatic conditions influence the plant growth and cause some biochemical changes. Drought is also one of the most important stress factors affecting the opium poppy plants. *In vitro* techniques provide to determine the effects of stress factors on plants in a short time and under controlled conditions. This study was carried out to determine the effects of drought stress on the growth, development and biochemical properties in four opium poppy cultivars (TMO-3, Tınaztepe, Zaferyolu and Kemerkaya) under *in vitro* conditions. For this aim, seeds were cultured on ½ MS medium added 3% sucrose, 1 mg l^{-1} gibberellic acid, 0.1 mg l^{-1} indol-3 acetic acid, 0.6% agar and different concentrations of PEG 6000 (0%, 2% and 4%). It was demonstrated that all of the investigated parameters were affected by the applications of PEG. An increase in PEG led to reduction in germination rate, shoot length and fresh plant weight while injury index, chlorophyll, proline, lipid peroxidation and antioxidant enzyme activities increased depending on rising of the PEG concentrations. As a result of this research, PEG treated plants compared to control plants, were negatively affected by drought stress induced by PEG and there were important differences among opium poppy cultivars in terms of resistance to drought.

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