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## Plant macromolecule from different species of Boraginaceae family and its anticancer efficacy

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The 13C NMR experiments of water-soluble high-molecular preparations from different species of *Boraginaceae* family *Symphytum asperum, S. caucasicum, S. officinale, S. grandiflorum* and *Anchusa italica* were carried out and simulated 13C NMR spectrum was calculated for 2-hydroxy-3-(3',4'-dihydroxyphenyl)-propionic acid residue (I) of the corresponding polyether using ACD/CNMR Version 1.1 program. Signal positions in the 13C NMR spectrum of this hypothetical structure (I) coincided satisfactory with the experimental values. According to 13C, 1H NMR, APT, 2D heteronuclear $^{1}H/^{13}C$ HSQC 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). The repeating unit of this polymer is 3-(3,4-dihydroxyphenyl)glyceric acid residue. Most of the carboxylic groups of PDPGA from *A. italica and S. grandiflorum* are methylated. PDPGA is endowed with intriguing pharmacological properties as anticomplementary, antioxidant, anti-inflammatory, burn and wound healing effect. The synthesis of racemic monomer of PDPGA 2,3-dihydroxy-3-(3,4-dihydroxyphenyl)propionic acid (DDPPA) was carried out via Sharpless asymmetric dihydroxylation of trans-caffeic acid derivatives using a potassium osmate catalyst. The PDPGA and DDPPA exerted anti-cancer efficacy *in vitro* and *in vivo* against 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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