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Chemopreventive Properties of Cannabis sativa L. var. USO31 in Relation to Its Phenolic and Terpenoid Content

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Abstract : Cannabis sativa L. is one of the oldest cultivated plant species known not only for its voluptuous use but also for the wide application in food, textile, and therapeutic industries. Recently, the progress of biotechnologies applied to medicinal plants has allowed to produce different hemp varieties with low content of psychotropic phytoconstituents (tetrahydrocannabinol < 0.2% w/v), thus leading to a renewed industrial and therapeutic interest for this plant. In this context, in order to discover new potential remedies of pharmaceutical and/or nutraceutical interest, the chemopreventive properties of different organic and hydroalcoholic extracts, obtained from the inflorescences of C. sativa L. var. USO31, collected in June and September harvesting, were assessed. Particularly, the antimutagenic activity towards the oxidative DNA-damage induced by tert-butyl hydroperoxide (t-BOOH) was evaluated, and the DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2'-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid) radical scavenging power of the samples were assessed as possible mechanisms of antimutagenicity. Furthermore, the ability of the extracts to inhibit the glucose-6-phosphate dehydrogenase (G6PD), whose overexpression has been found to play a critical role in neoplastic transformation and tumor progression, has been studied as a possible chemopreventive strategy. A careful phytochemical characterization of the extracts for phenolic and terpenoid composition has been obtained by high performance liquid chromatography (HPLC) and gas chromatography-mass spectrometry (GC-MS) methods. Under our experimental condition, all the extracts were found able to interfere with the tBOOH-induced mutagenicity in WP2uvrAR strain, although with different potency and effectiveness. The organic extracts from both the harvesting periods were found to be the main effective antimutagenic samples, reaching about a 55% inhibition of the tBOOH-mutagenicity at the highest concentration tested (250 µg/ml). All the extracts exhibited radical scavenger activity against DPPH and ABTS radicals, with a higher potency of the hydroalcoholic samples. The organic extracts were also able to inhibit the G6PD enzyme, being the samples from September harvesting the highly potent (about 50% inhibition respect to the vehicle). At the phytochemical analysis, all the extracts resulted to contain both polar and apolar phenolic compounds. The HPLC analysis revealed the presence of catechin and rutin as the major constituents of the hydroalcoholic extracts, with lower levels of quercetin and ferulic acid. The monoterpene carvacrol was found to be an ubiquitarian constituent. At GC-MS analysis, different terpenoids, among which caryophyllene sesquiterpenes, were identified. This evidence suggests a possible role of both polyphenols and terpenoids in the chemopreventive properties of the extracts from the inflorescences of C. sativa var. USO31. According to the literature, carvacrol and caryophyllene sesquiterpenes can contribute to the strong antimutagenicity although the role of all the hemp phytocomplex cannot be excluded. In conclusion, present results highlight a possible interest for the inflorescences of C. sativa var. USO31 as source of bioactive molecules and stimulate further studies in order to characterize its possible application for nutraceutical and pharmaceutical purposes.

Keywords : antimutagenicity, glucose-6-phosphate dehydrogenase, hemp inflorescences, nutraceuticals, sesquiterpenes
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