PHYTOCHEMICAL AND PHARMACO-TOXICOLOGICAL CHARACTERIZATION ON WATER HEMP WATER EXTRACTS

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Introduction: Traditionally considered a multiuse crop, hemp has been widely cultivated and studied, with particular regards to potential pharmaceutical applications of fiber, seeds and essential oil. By contrast, scientific literature lacks on chemical composition or biological activity data from aqueous fraction obtained from industrial hemp female flowers, which have long been considered as waste products. Considering that one of the most promising economic perspectives of hemp are female inflorescences, sold dried to obtain a home-made decoction or infusion, the main focus of the following study is the evaluation of potential protective effects related to water extracts from plant female inflorescences belonging to four commercial hemp cultivars, named Futura 75, Kc virtus, Carmagnola Cs and Villanova.

Materials and methods: Particularly, we evaluated the phytochemical and phytotoxic profile, with regards to phenol and flavonoid content and effects on lettuce seed growth and germination, respectively. Then we studied the water extracts both in vitro and *ex vivo* in order to assay the extract biocompatibility, in multiple cell lines (C2C12and HCT116), and the protective effects in an experimental model ulcerative colitis constituted by isolated rat colon specimens challenged with E. Coli lipopolysaccharide (LPS). In LPS-stimulated colon, we also assayed the effects of the extracts on multiple oxidative stress and inflammation biomarkers, including nitrites, prostaglandin (PG)E_2, malonyldialdheyde (MDA) and serotonin (5-HT).

Results: The results indicated that all four cultivar extracts displayed similar total phenol and flavonoid content. Additionally, the toxicological studies revealed that all the cultivars were tolerated in the employed models. On the other hand, Futura 75cultivar extract displayed a better antioxidant and anti-inflammatory profile, resulting able to downregulate all the tested biomarkers, in rat colon. Considering this better protective profile, Futura 75extract has been assayed in a subsequent set of experiments in order to evaluate its effect on pathogen bacterial and fungal species involved in ulcerative colitis, including S. aureus, E. coli, P. aeruginosa, C. albicans and C. tropicalis, finding a significant inhibition on the growth of C. albicans and all selected Gram positive and negative bacterial strains.

Discussion and conclusion: Taken together, our results support the potential efficacy of Futura 75water extracts in managing the clinical symptoms related to ulcerative colitis.
Finally, in agreement with the accepted principle of "Circular Economy", our findings further support an intriguing approach to innovatively improve hemp chain production by considering that flower, once considered only as waste, could become high quality byproduct with potential pharmaceutical applications.