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Bioactivity of the vitamin D2-enriched extract from surplus mushrooms

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A percentage as high as 20% of surplus might be generated during mushroom production. These mushrooms have low industrial application because they are in an advanced stage of maturation, or they have deformed lids and/or stems that do not meet the specifications established by retailers, so they are considered mushrooms of low economic value. In their natural state, mushrooms present very low concentrations of vitamin D2. Nonetheless, researchers have found them to be a rich source of ergosterol (pro-vitamin D2), which can be converted into vitamin D2 by artificial UV irradiation. Thus, the irradiation of surplus mushrooms to obtain vitamin D2 is a sustainable strategy to increase vitamin D availability, and, in this work, the bioactive effects and potential toxicity of vitamin D2-rich extracts were evaluated. The surplus production from *Agaricus bisporus* Portobello were supplied by Ponto Agrícola, Baião, north of Portugal. Ultrasonic Assisted Extraction (UAE) was used to obtain an ergosterol-rich extract, which was subsequently irradiated with UV-C to obtain a vitamin D2-rich extract. The irradiation was performed in an ultraviolet (UV-C) radiation chamber. Vitamin D2 was analysed by high performance liquid chromatography coupled with an ultraviolet detector (HPLC-UV). To evaluate the bioactivity in cell lines, four human tumour cell lines (MCF-7 - breast adenocarcinoma, NCI-H460 - non-small cell lung cancer, AGS - gastric cancer, and CaCo-2 - colorectal adenocarcinoma and one non-tumoural cell line of bone origin (h-FOB 1.19 - human osteoblasts)) were used. Cell proliferation in the presence and absence of functional extract and pure vitamin D2 was assessed using the sulforhodamine B (SRB) assay. The sample of pure vitamin D2 tested did not reveal activity at the evaluated concentrations (GI50 values > 400 µg/mL) for all the cell lines tested (tumoural and non-tumoural). However, the vitamin D2-rich extract presented effective activity in the AGS (82 µg/mL) tumoural cell line and moderate activity in the NCI-H460 (293 µg/mL) and CaCo-2 (377 µg/mL) tumour cell lines. It is noteworthy that neither vitamin D2-rich extracts nor pure vitamin D2 presented cytotoxicity against the h-FOB 1.19 (GI50 > 400 µg/mL). These results are good indicators of the feasibility of industrial surplus mushrooms as sustainable vitamin D2 food sources, and they could be of added value to promote the agricultural sector or the food and pharmaceutical industries.

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