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Innovative Phytodefense Colloidal Delivery System Based On Chestnut Spiny Bur Extract

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Exploiting agri-food by-products is a pertinent strategy in the context of implementing the circular economy concept in the agri-food industry. In this context, the hydroalcoholic extract (CSB-H) of chestnut spiny burs of *C. Sativa* Mill and its main compounds (hydrolysable tannins and flavonoids) showed a marked free radical scavenging activity and efficacy in the inhibition of phytopathogenic fungi such as *Alternaria alternata*, *Fusarium solani* and *Botrytis cinerea*, responsible for foodstuffs deterioration [1-2]. The functional activity highlighted suggests its potential use in the phytodefense of IV range plants. Although the extract has higher and demonstrated functional efficacy, its use in the dry form has poor applicability due to different critical issues such as unpleasant organoleptic characteristics, poor solubility in water, and lower stability. This work aimed to develop a technological-formulation protocol using the spray-drying technique to convert raw extract (CSB-H) into a stable, water-soluble, easy-to-handle ingredient useful in the phyto-defence of seedlings of the fourth range[3]. This work aimed to develop a technological approach to convert raw hydroalcoholic extract (CSB-H) of chestnut spiny burs into a stable, water-soluble ingredient useful in phytodefense. The design of an adequate multicomponent polymer matrix, of natural origin/derivation, (inulin/sodium carboxymethylcellulose/SLS) and of the spray drying process parameters have improved its technological and biological characteristics, obtaining a functional ingredient in the form of a water-dispersible powder, easy to dose and manipulate, with improved stability that make it useful in agriculture field. In vivo studies have demonstrated the effectiveness of the ingredient in the field. Even the powder not loaded with the extract (blank) acts synergistically, providing some protection to the leaves, due to the film-forming properties of its components. The developed technological approach led to obtaining high production yields (greater than 60%), and higher encapsulation efficiency of 100%. Finally, in the dissolution and permeation assays, a technological improvement was observed for both profiles for the microparticle powder containing the extract, compared to the unprocessed extract, suggesting an increase in bioavailability after in vivo administration. These results show that the selected technological approach combined widelivery system designs parameters and a careful design of the delivery system led to obtaining a stable and functional microparticulate powder, potentially useful as an innovative ingredient in phytodefense, and scalable to an industrial approach.

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