

## **Recycling Agri-Food Biowaste for Sustainable Industrial Application**

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### **Abstract**

The food industry, that applies artificial additives into their food formulations has been focused its efforts on the development of innovative food formulations with natural agents, promoting safety, health maintenance and well-being, as also providing additional bioactive benefits. Besides the food industry, these bio-based ingredients are also highly necessary in other industries such as the pharmaceutical and cosmetic ones, for use in formulations with medicinal, therapeutic and antioxidant properties. Currently, the promotion of circular economy is under strong exploitation, in the recycling of low economic raw materials into highly valuable sources of molecules with effective functionality, thus replacing the use of artificial agents. In this presentation, successful achievements will be presented, resulting from the work developed regarding the extraction, stabilization, and application of natural additives in the industry. As a result of decades of studies regarding the exploitation of natural matrices and given the antioxidant and antimicrobial properties exhibited by the polyphenol extracts of strawberry-tree, basil, lemon balm, chestnut flowers, fennel, and german chamomile, they were used as preservatives in loaf bread, cupcakes, yogurt, cheese, among others. These polyphenols are mainly flavonoids (catechin, quercetin and luteolin derivatives), phenolic acids (rosmarinic, chicoric, lithospermic, caffeic, caffeoylquinic acids), and hydrolysable tannins (trigalloyl-HHDP-glucoside). Also, colouring molecules like betalains (gomphrenins, isogomphrenins) from purple globe amaranth and anthocyanins (cyanidin, delphinidin, and malvidin derivatives) from rose, dahlia, centaurea, strawberry-tree, roselle, blueberry, sweet cherry, fig peel, blackthorn epicarp, were applied in yogurt, waffles, donut topping, among other foods. Ergosterol and vitamin D2 obtained from mushroom bioresidues were also explored as bioactive ingredients in dairy and bread products. Another important study ongoing is the evaluation of different genotypes of pumpkins from different countries from the Mediterranean region (Pulping project), aiming at establishing the ideal cultivation conditions as well as using the pumpkin bioresidues to develop a natural preservative to be used in an innovative pumpkin pulp, since the residues, specifically seeds, peel and fibrous strands, demonstrated to be a great source of antioxidants, without hepatotoxicity. These findings are already under use by several industries, namely the food sector.

**Keywords:** circular economy, sustainability, biowaste, high valuable molecules, natural additives.

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