

N°1007 / PC

TOPIC(s) : Industrial biocatalysis / (Chemo)enzymatic strategies

Sustainable valorization of agro-food industry by-products for production of vanillin and vanillic acid

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PURPOSE OF THE ABSTRACT

Vanillin is the compound of great interest to the industry. It is used to augment and enhance the aroma and taste of food preparations, perfumes, and detergents. Vanillic acid, which is a derivative of vanillin, has many biological activities, which have been mainly used in the pharmaceutical industry as a precursor for the production of drugs and an antioxidant. Currently, 85% of the world's supply is vanillin synthesized chemically from guaiacol, and the remaining 15% is produced from lignin, either by extraction from vanilla seeds and microbial biosynthesis (<1%). [1]

The key concept of modern industrial biotechnology is green chemistry, in particular the application of the principles of sustainable development and the implementation of the circular economy in production processes. In this view, biocatalysis and utilizing organic wastes and by-products are among the most promising green research areas for sustainable manufacturing of food ingredients, pharmaceutical intermediates, and fine chemicals.

The main goal of this research was to screen microorganisms capable of releasing ferulic acid from raw materials such as brewery spent grain (BSG) and linseed oilcake (LOC) and then transforming it into phenolic compounds attractive for the industry, such as vanillin and vanillic acid (Figure 1). Strains were purchased from commercially available collections and have also been isolated by us from different environments. The tests were performed in Submerged Fermentation system (containing a liquid medium where the carbon source was replaced with selected by-product) and Solid-State Fermentation system using moistened agro-food industry by-products. The progress of the process was controlled over time by the use of chromatographic techniques. As a result, biocatalysts were divided into three groups: (1) effectively releasing ferulic acid from by-products, (2) biosynthesizing vanillic acid, and (3) vanillin from ferulic acid released from by-products.

FIGURES

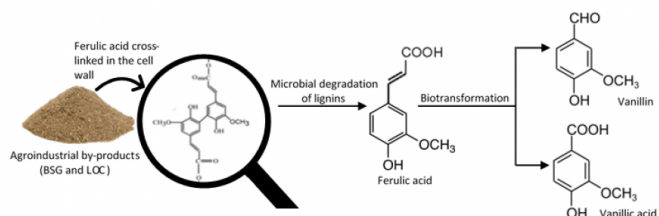


FIGURE 1

Figure 1.

Production of phenolic compounds from agroindustrial by-products.

FIGURE 2

KEYWORDS

vanillin | natural flavours | by-products valorization | Solid-State Fermentation

BIBLIOGRAPHY

[1] W. Huang, C.Y. Du, J.A. Jiang, Y.F. Ji, Res. Chem. Intermed. 2013, 39 (6).