Biovanillin: production concepts and prevention of side product formation

ABSTRACT

Application of biotechnological tools as an imminent basis for biovanillin production was established promising using microbes via utilization of readily available agro-based supplies as precursors, and the process was universally accepted as natural. However, the production process was confronted with certain bottlenecks including undesired product formation, ineffective flow of metabolism, product toxicity, and further product degradation by the microbes, which could result to the dwindling of biovanillin concentration within the process. This review paper outlines the various routes and strategies to overcome these setbacks using fed-batch fermentation culture mode with adsorbent resins, activated carbon, and simply metabolized carbon sources and enzyme inducers like cellobiose and maltose. The review aims to provide ample information for diverse utilization of microorganisms like fungi, bacteria, and yeast with diverse biotechnological approaches and metabolic pathways using various precursors such as ferulic acid, isoeugenol, and eugenol, which could be extracted from readily available and cheaper agro-based materials like maize bran, maize stalk, sugar beet pulp, wheat bran, and rice bran oil for biovanillin transformation. The review could equally help researchers and biotechnology industry to explore the optimization process of the whole systems of biovanillin production via utilization of production strains with more tolerance to toxic effect of both the precursors and the biovanillin in a bioreactor with fed-batch fermentation culture mode together with adsorbent resins, shorter incubation time, and effective downstream processing with the target of reducing the production cost of the biotechnology-derived biovanillin to gain remarkable and higher economic value against the vanillin obtained by chemical synthesis.

Keyword: Adsorbent resins; Activated carbon; Biovanillin; Ferulic acid; Metabolic pathway; Side product formation